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PREFACE

Apollo Terminology definitions presented herein are intended to provide Apollo program participants with an updated collection of terminology used on the Apollo program. Nothing contained herein shall be construed to modify or effect in any way any existing contract or subcontract.

This publication will be maintained current by periodic supplements or revisions. Forms are provided in the back of this publication to provide the user with a simple and effective means of submitting comments, recommendations for additions, deletions, or revisions to Apollo Terminology. Comments regarding Apollo Terminology are solicited and should be forwarded to:

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A

ABLATION
Sublimation, vaporization, or melting of a surface material due to heating resulting from a fluid moving past it at high speed. This phenomenon is often used to protect a structure from overheating by providing an expendable ablation surface, such as the heat shield on a reentry vehicle, or a protective coating in a combustion chamber.

ABLE
Upper stage of a launch vehicle based on either Thor or Atlas missiles.

ABORT
Premature and abrupt termination of a mission because of existing or imminent degradation of mission success probability.
See—pad abort

ABORT MODE
The technique employed for abort.

ABSOLUTE MINIMUM POINT
In statistics a point at which the value of the function is less than at any other point in the entire region being considered.

ACC
Acceptance.

ACCELEROMETER
An instrument which measures acceleration or gravitional forces capable of imparting acceleration.
See—pulsed integrating pendulum accelerometer

ACCEPTABLE ENVIRONMENTAL RANGE TEST
Test to determine the range of the environmental conditions in which an equipment has a reliability at least as high as required.

ACCEPTABLE QUALITY LEVEL **AQL**
A nominal value expressed in terms of percent defective or defects per hundred units, whichever is applicable, specified for a given group of defects of a product.

ACCEPTABLE RELIABILITY LEVEL **ARL**
A nominal value expressed in terms of percent failure per thousand operating hours specified for acceptance of parts or equipment. It is a measure of reliability which will be accepted, some preassigned percentage of the time, by a reliability sampling plan.

ACCEPTANCE **ACC**
The act of an authorized representative of the Government by which the Government assents to ownership of existing and identified articles, or approves specific services rendered as partial or complete performance of the contract.
See—probability of acceptance

ACCEPTANCE INSPECTION
Examination and testing, to determine conformance of the supplies or services to certain specified requirements, which serve as a basis for acceptance.

ACCEPTANCE NUMBER
The largest number of defectives (or defects) in the sample or samples under consideration that will permit the acceptance of the inspection lot.

ACCEPTANCE SAMPLING
The art or science that deals with procedures in which decisions to accept or reject lots or processes are based on the examination of samples.

ACCEPTANCE SAMPLING PLAN
A specific plan which states the sample sizes, and the criteria for acceptance, rejection, or the taking of another sample.

ACCEPTANCE TEST
Test to determine conformance to design or specifications as a basis for acceptance. When specially designed they may apply to parts, equipments or systems.
See—component acceptance test
flight acceptance test
statistical acceptance test
vehicle acceptance test

ACCESSIBILITY
A quality of design that permits ready access for testing, fault detection, and repair or replacement.

ACCESSORY **ACCRY**
A part, subassembly or assembly designed for use in conjunction with or to supplement another assembly, unit, or set. An accessory contributes to the effectiveness of the assembly or set thereof without extending or varying the basic function.

ACCRY
Accessory.

ACE
Automatic Checkout Equipment

ACHIEVED RELIABILITY
The reliability demonstrated by the physical item. It consists of inherent reliability with any degradation that

occurs in manufacture, shipping, handling, storage, maintenance, or use. Statement of achieved reliability must include specifications of conditions under which demonstrated.

ACOUSTIC VELOCITY
The speed of propagation of sound waves. Also called speed of sound.

ACOUSTIC VIBRATION
Vibration, with respect to operational environments, transmitted through a gas. The vibration may be sonic, subsonic, or ultrasonic.

ACOUSTICAL NOISE
A vibration of audible frequency.

ACPM
Attitude Control Propulsion Motors.

ACTIVE REPEATER SATELLITE
A communications satellite which, using on-board power supplies, receives, amplifies, and retransmits radio signals from ground terminals.

ACTUAL FIT
The relationship existing between them with respect to the amount of clearance or interference which is present when they are assembled.

ACTUAL SIZE
Measured size.

ACTUAL WEIGHT
Weight of a part determined by weighing-in after assembly.

ACTUATOR
See—gimballed actuator
rotary hydraulic actuator

ADAPTER SKIRT
A flange or extension of a space vehicle stage or section that provides a ready means for fitting some object, such as another stage or section to it.

ADAPTIVE CONTROL SYSTEM
Control system which is capable of adjusting its parameters to meet changing performance requirements.

ADDITIVE
A substance added to a base to achieve some purpose such as a more even rate of combustion in a propellant, or improved lubrication properties of working fluids such as RP-1 etc.

ADP
Automatic Data Processing.

ADVANCED SATURN
Previous designation for Saturn V.

ADVANCED SCHEMATIC
A schematic diagram that additionally identifies connections and terminals, but still without giving physical locations of components.

ADVANCED SYNCOM
An advanced 24-hour orbit, wideband, active-repeater, communications satellite, capable of transmitting up to 4 TV channels or several hundred two-way radio channels. Tentatively scheduled for launch in 1965 and 1966.

ADVANCED SYSTEMS
A composite of equipment, skills, and techniques used as a vehicle for advancing technology. Design, development, and construction of advanced systems are directed toward extending scientific knowledge and early attainment of an operational capability.

AEC
Atomic Energy Commission.

AEDC
Arnold Engineering Development Center.

AEROBALLISTICS
Term derived from aerodynamics and ballistics, dealing primarily with the motion of bodies whose flight path is determined by applying the principles of both sciences to different portions of the path.

AEROBIOLOGY
The study of the distribution of living organisms freely suspended in the atmosphere.

AERODUCT
A ramjet-type engine designed to scoop up ions and electrons freely available in the outer reaches of the atmosphere or in the atmospheres of other spatial bodies. A chemical process within the duct of this engine expels particles derived from the ions and electrons as a propulsive jet stream.

AERODYNAMIC HEATING
The heating of a body by the high speed passage of air or other gases over the body, caused by friction and by compression processes.

AERODYNAMIC VEHICLE
A device, such as an airplane or glider, capable of flight within a sensible atmosphere and relying on aerodynamic forces to maintain flight.

AERODYNAMICS
Science of motion of bodies relative to the air and the forces acting on the bodies, especially in flight through the air.

AEROELASTICITY
The study of the effect of aerodynamic forces on elastic bodies.

AEROEMBOLISM
(1) The formation or liberation of gases in the blood vessels of the body, as brought on by a change from a relatively high atmospheric pressure to a lower one.
(2) The disease or condition caused by the formation or liberation of gases in the body. The disease is characterized principally be neuralgic pains, cramps, and swelling which sometimes results in death. Also called decompression sickness.

AEROLITE
A meteorite composed principally of stony material.

AEROMEDICINE
Alternate for aerospace medicine.

AERONAUTICAL SYSTEMS DIVISION **ASD**
Division of the Air Force Systems Command, located at Wright-Patterson Air Force Base, Ohio. Responsible for aircraft and air launched missile programs assigned to the Air Force for conducting research and development, test, evaluation in aerodynamics, human factors, materials, electronics, and aerospace sciences. Formerly called Wright Air Development Division.

AERONOMY
The study of the atmosphere, especially its relation to the Earth and the effect upon it of bombardment by radiation from space.

AEROPAUSE
A region of indeterminate limits in the upper atmosphere, considered as a boundary or transition region between the denser portion of the atmosphere and space.

AEROS
Meteorological satellite in stationary orbit (NIMBUS follow-on).

AEROSPACE GROUND EQUIPMENT **AGE**
All equipments required on the ground to make an aerospace system operational in its intended environment.

AEROSPACE MEDICINE
That branch of medicine dealing with the effects of flight through the atmosphere or in space upon the human body, and with the prevention or cure of physiological or psychological malfunctions arising from these effects.
See—space medicine

AEROSPACE VEHICLE
A manned or unmanned vehicle which may be operated either in atmosphere or in space.

AEROTHERMODYNAMIC BORDER
An altitude at about 100 miles, above which the atmosphere is so rarefied that the motion of an object through it at high speeds generates no significant surface heat.

AEROTHERMODYNAMICS
The study of the aerodynamic and thermodynamic problems connected with aerodynamic heating.

AFB
Air Force Base.

AFBSD
Air Force Ballistic Systems Division.

AFCS
Automatic Flight Control System.

AFMTC
Air Force Missile Test Center.

AFRM
Advanced Flight Research Model.

AFSC
Air Force Systems Command.

AFSSD
Air Force Space Systems Division.

AFTERBURNING
Irregular burning of fuel left in the firing chamber of a rocket after fuel cutoff.

AGANI
Apollo Guidance and Navigation Information.

AGARD
Advisory Group for Aeronautical Research and Development.

AGAVE
Automatic Gimballed Antenna Vectoring Equipment.

AGC
Apollo Guidance Computer.

AGE
Aerospace Ground Equipment.

AGGD
Apollo Guidance Ground Display.

AGNIS
Apollo Guidance and Navigation Industrial Support.

AGRAVIC
Unaffected by gravitation, weightless.

AIR BREAKUP
Disintegration of a vehicle by aerodynamic forces upon its reentry into the atmosphere. May be induced deliberately to reduce the impact velocity of test records and instruments to be recovered.

AIR FORCE BALLISTIC SYSTEMS DIVISION **AFBSD**
Division of the Air Force Systems Command, located at Inglewood, Calif., responsible for Atlas, Titan, and Minuteman Intercontinental Ballistic-Missile Programs, including activation of missile sites.

AIR FORCE SPACE SYSTEMS DIVISION **AFSSD**
Division of the Air Force Systems Command, located at Inglewood, Calif., responsible for military space programs. Assigned to the Air Force and used for development projects in support of the Army, Navy, and National Aeronautics and Space Administration. Formerly called Ballistic Missile Division.

AIR FORCE SYSTEMS COMMAND **AFSC**
Major command of the Air Force, headquartered at Andrews AFB, Md., responsible for research, development, procurement, checkout, and delivery to the using command of Aerospace Weapon Systems and Equipment. Formerly called Air Research and Development Command.

AIR SHOWER
A grouping of cosmic-ray particles observed in the atmosphere.

AIR SOUNDING
The act of measuring atmospheric phenomena or determining atmospheric conditions at altitude, especially by means of apparatus carried by balloons or rockets.

AIR-BREATHING ENGINE
An engine which requires the intake of air for combustion of the fuel, as in a ramjet or turbojet. This is contrasted with the rocket engine which carries its own oxidizer and can operate beyond the atmosphere.

AIRFOIL DIVERGENCE
The static torsional instability which occurs when the airfoil structural rigidity is exceeded by aerodynamic twisting effects.

AIRFRAME
The assembled principal structural and aerodynamic components of a vehicle, less propulsion systems, control and guidance equipments, and payloads. The airframe includes only the basic structure, that is, the space frame on which equipment is mounted.

AIRGLOW
The visible light, appearing at night, in the upper atmosphere that results from energy released by dissociated molecules and ionized atoms which had absorbed energy from solar radiation during the daytime.

ALBEDO
The ratio of the amount of electomagnetic radiation reflected by a body to the amount falling upon it, commonly expressed as a percentage.

ALGA
(Usually plural, algae). Unicellular and multicellular plants considered as a potential source of food and oxygen in a closed ecological system for space vehicles.

ALIGNMENT SYSTEM
See—vertical alignment system

ALLOWANCE
The prescribed difference between the maximum material condition of mating parts. It is the minimum clearance (positive allowance) or maximum interference (negative allowance) between such parts.

ALOUETTE
US—Canada ionospheric research satellite (part of Topside Sounder).

ALTERNATE MISSION
A secondary flight plan which may be selected when the primary flight plan has been abandoned for any reason other than abort.

AMAL
Aviation Medical Acceleration Laboratory (USN).

AMBIENT CONDITION
Environmental conditions such as pressure, temperature, etc., which are normal for the location under discussion.

AMES RESEARCH CENTER **ARC**
This NASA center, located at Moffett Field, Mountain View, Calif., conducts basic and applied research on aerodynamics of reentry vehicles, flight control of space vehicles and aircraft, and space environment physics. NASA life sciences advanced research and technology has been assigned to Ames Research Center.

AMR
Atlantic Missile Range.

ANACOUSTIC ZONE
Zone of silence in space. The region of altitude where distances between rarefied air molecules are so great that sound waves are not propagated.

ANALOG COMPUTER
A computing machine that works on the principle of measuring (as distinguished from counting) in which the input data are made analogous to a measurement continuum, such as voltage, linear lengths, resistance, light intensity, etc., which can be manipulated by computer.

ANALYSIS
See—failure mode analysis
failure mode analysis
function analysis
maintenance analysis
mission analysis
task analysis

ANALYTIC MODEL
A mathematical model which is represented by continuous, differentiable equations.

ANECHOIC
Without echoes.

ANGLE OF ATTACK
The acute angle between a reference line in a body and the line of relative wind direction, projected on a plane containing the reference line and parallel to the axis of symmetry.

ANGSTROM
A unit of length, used chiefly in expressing short wavelengths. Ten billion angstroms equal one meter.

ANGULAR DIMENSIONING
A method for indicating the position of a point, line or surface by means of a linear dimension and angle, other than the 90 percent angle implied by the horizontal and vertical center lines.

ANHYDROUS
Free of water.

ANNULAR ECLIPSE
An eclipse in which a thin ring of the source of light appears around the obscuring body.

ANNULAR SPACE
Term refers to the space between the walls of a thermos jug, dewar, or storage tank, such as a LOX or LH-2 (liquid hydrogen), storage tank.

ANOMALISTIC PERIOD
The interval between two successive perigee passages of a satellite in orbit about a primary. Also called perigee-to-perigee period.

ANOXIA
An absence of oxygen in the blood, cells or tissues of the body. A condition which rarely exists, hypoxia is the more perferable term.

ANTHROPOMETRY
The science of measuring the human body, its parts and functional capacities.

ANTI–G SUIT
A tight fitting suit that covers parts of the body below the heart. It is designed to retard the flow of blood to the lower body in reaction to acceleration or deceleration. Bladders or other devices are used to inflate and increase body constriction as G force increases.

ANTIATOM
Postulated elemental particle consisting of a negative nucleus with positive electrons in orbit. The atom of the known world consists of a positive nucleus with negative electrons in orbit.

ANTICRITICALITY CONCEPT
A concept for a safety measure that prevents too rapid an energy release from a nuclear reaction so that a dangerous state may not be reached by the reactor.

ANTIGRAVITY
A hypothetical effect that would arise from some energy field's cancellation of the effect of the gravitational field of the Earth or other body.

ANTIMATTER
Matter theoretically considered to exist, consisting of antiatoms.

AOQ
Average Outgoing Quality.

AOQL
Average Outgoing Quality Limit.

AP
Auto Pilot.

APERTURE CARD
A file or tabulating card with a rectangular hole specifically designed for the mounting of a film image or images.

APHELION
The point at which a planet or other celestial object, in its orbit about the sun, is farthest from the sun.

APOCYNTHION
The point in an elliptical orbit about the moon at which an orbiting vehicle is farthest away from the moon.

APOGEE
A point on the orbit of a body which is at the greatest distance from the center of the earth.

APOGEE ROCKET
A rocket attached to a satellite or spacecraft designed to fire when the craft is at apogee, the point farthest from the Earth in orbit. The effect of the apogee rocket is to establish a new orbit farther from the Earth or to allow the craft to escape from Earth orbit.

APOLLO
A term generally used to describe the NASA Manned Lunar Landing Program but specifically used to describe the effort devoted to the development test and operation of the space vehicle for long duration, Earth orbit, circumlunar, and lunar landing flights.

APOLLO GUIDANCE AND NAVIGATION INFORMATION AGANI
A communication medium giving technical information on all aspects of the Apollo work at Massachusetts Institute of Technology (MIT). It is a working document for all personnel of the laboratory who have need to refer to authoritative Apollo data.

APOLLO GUIDANCE COMPUTER AGC
A general purpose computer incorporating fixed and erasable memory storage.

APOLLO GUIDANCE GROUND DISPLAY AGGD
Ground support equipment (GSE) to display and record guidance information transmitted via the operational communication link.

APOLLO PROJECT DIRECTIVE
A consolidated summary of the objectives, management structure, policies, and schedules for the project, required

in order to assure technical, managerial, and administrative control.

APOLLO SPACECRAFT
The vehicle required to perform the Apollo mission after separation of the final launch stage. It consists of the command module (CM), the service module (SM), the lunar excursion module (LEM), the launch escape system (LES), and the spacecraft adapter.

APPROVED PART
A part considered acceptable for an application based on engineering evaluation and past useage, but which has not passed a qualification test.

APPROVED PARTS AND MATERIAL LIST
A list of all parts and materials that are approved for the application intended. The list includes equipment qualified either as a part of the program in question or from previous programs.

APU
Auxiliary Power Unit.

AQL
Acceptable Quality Level.

ARC
Ames Research Center.

ARC-JET
An electric rocket system in which a gas is heated by being passed through an electric arc and accelerated through a nozzle, similar to a chemical rocket nozzle, to produce thrust.

ARIEL
US–United Kingdom ionospheric research satellite.

ARL
Acceptable Reliability Level.

ARM
See–launch support and holddown arm
launch support arm
umbilical service arm
umbilical swing arm

ARMING TOWER
A steel tower like structure which will be used for installation of space vehicle ordnance items and may be used for loading the space vehicle hypergolic storable propellants and the spacecraft high purity LOX and LH-2 (liquid hydrogen).

ARRANGEMENT DRAWING
Shows projection or perspective of items, with or without controlling dimensions, to indicate their relationship.

ARTICLE
A unit of hardware, or any portion thereof, required by the contract.

ARTIFICIAL ENVIRONMENT
The state or conditions produced in a controlled test space which generates a simulated natural environment as an input to the equipment under going test.

ARTIFICIAL EARTH SATELLITE
A man-made Earth satellite, as distinguished from the Moon. Usually called Earth satellite.

ARTIFICIAL GRAVITY
A simulated gravity established within a space vehicle, as by rotating a cabin about an axis of a spacecraft. The centrifugal force generated being similar to the force of gravity.

ASCS
Automatic Stabilization and Control System.

ASIS
Abort Sensing and Implementation System.

ASME
American Society of Mechanical Engineers.

ASN
Average Sample Number.

ASPIRATOR
Any device used as a suction pump, for producing the movement of fluids by suction.

ASPO
Apollo Spacecraft Project Office. (NASA/MSC)

ASSEMBLY **ASSY**
A number of parts or subassemblies or any combination thereof joined together to perform a specific function.
See–cable assembly
detail assembly drawing
harness assembly
inseparable assembly drawing
interdependent assembly or unit of equipment
major assembly
minor assembly
nondependent assembly or unit of equipment
permanently fastened assembly drawing

ASSEMBLY DRAWING
Depicts the assembled relationship of two or more items or a group of items and assemblies, or a group of assemblies required to make up an assembly.
See–cable assembly drawing
detail assembly drawing
inseparable assembly drawing
permanently fastened assembly drawing

ASSIGNABLE CAUSE
A factor contributing to the variation in quality and is economically feasible to identify. Assignable causes must be identified and removed to attain statistical control.

ASSOCIATE CONTRACTOR
The contractor who under direct contract to NASA performs work excluded from the principal contract. The associate

contractor is responsible to the principal contractor for technical integration of the (sub) system and must coordinate technical developments and requirements in a timely and organized manner. The associate contractor is directly responsible to NASA for administrative and contractual matters.

ASSY
Assembly.

ASTEROID
One of the many small celestial bodies revolving around the Sun, most of the orbits being between Mars and Jupiter. Also called planetoid or minor planet.

ASTIA
Armed Services Technical Information Agency.

ASTRIONICS
Electronics as applied especially to astronautics.

ASTRO
A prefix meaning star or stars and, by extension, sometimes used as the equivalent of celestial, as in astronautics.

ASTROBIOLOGY
A branch of biology concerned with the discovery or study of life on planets.

ASTRODYNAMICS
The practical application of celestial mechanics, astroballistics, propulsion theory, and allied fields to the problem of planning and directing the trajectories of space vehicles.

ASTROGATION
Contraction of astronavigation.

ASTROMETRICS
A branch of astronomy concerned with the measurements of celestial bodies and the determination of their movements and positions.

ASTRONAUT
One who navigates through space.

ASTRONAUTICS
The science and technology of space flight.

ASTRONAVIGATE
To guide and direct a spacecraft from within the vehicle, by means of observations on celestial bodies.

ASTRONOMICAL UNIT
The mean distance between the Earth and the Sun. Approximately 93,000,000 miles.

ASTRONOMY
See—galactic astronomy
radar astronomy
radio astronomy

ASTROPHYSICS
The study of the physical and chemical nature of celestial bodies and their environments.

ASTROTRACKER
Instrumentation required for celestial navigation aboard a spacecraft.

ATI
Average total inspection.

ATLANTIC MISSILE RANGE **AMR**
An instrumented missile test range extending some 5000 to 6000 miles from Cape Canaveral, Florida to a point beyond ascension auxiliary AFB. It includes a series of island based tracking stations and ocean range vessels to gather performance data.

ATMOSPHERE
The body of air surrounding the earth. Also the body of gases surrounding or comprising any planet or other celestial body.
See—cytherean atmosphere
effective atmosphere

ATMOSPHERIC BRAKING
The action of atmospheric drag in decelerating a body that is approaching a planet. Can be deliberately used, where sufficient atmosphere exists, to decrease the vehicle velocity before landing.

ATMOSPHERIC REFRACTION
Refraction of light from a distant point by the atmosphere, caused by its passing obliquely through varying air densities.

ATMOSPHERIC TRAJECTORY
That portion of the return mission from orbital condition which is conducted within the atmosphere.

ATOMIC ENERGY COMMISSION **AEC**
The U. S. Civilian Governmental Agency, established by the Atomic Energy Act of 1946, to supervise and control the production of nuclear-fissionable radioactive materials in the United States.

ATOMIC LATTICE
The arrangement of particles on the atomic nuclei to form a crystal.

ATOMIC ROCKET ENGINE
Projected rocket engine in which energy for the jet stream would be generated by atomic fission or fusion.

ATTACHING DEVICES
Those parts, such as bolts, rivets, clamps, etc. which are used to affix one part, component, assembly or installation to another.

ATTACHMENT
A part, subassembly or assembly designed for use in conjunction with another assembly or a unit or set, contributing

to the effectiveness thereof by extending or varying the basic function of the assembly unit or set.

ATTITUDE
The position of a vehicle or craft etc., as determined by the inclination of its axis to some frame of reference. If not otherwise specified, this frame of reference is fixed to the earth.

ATTITUDE CONTROL PROPULSION MOTORS ACPM
Vernier engines that are used to control attitude of the spacecraft. They are part of the reaction control system (RCS).

ATTITUDE-CONTROL SYSTEM
A system within the flight-control system to maintain the desired attitude of a vehicle.

ATTRIBUTE
A characteristic or property which can be appraised only in terms of whether it does or does not exist.
See—inspection by attributes
method of attributes

ATTRIBUTES TESTING
Testing to determine the qualities of an item with regard to determining the presence or absence of some characteristic or attribute.

AUGMENTOR
A duct usually enclosing the exhaust jet behind the nozzle exit section to provide increased thrust.

AURORA
The sporadic visible emission from the upper atmosphere over middle and high latitudes. Also called "Northern Lights".

AUTO PILOT AP
An assembly, containing gyros with rotating mass, that is vehicle fixed and referenced to the vehicle, and supplies attitude signals to the vehicle control system.

AUTO-IGNITING PROPELLANT
Any liquid propellant that ignites, with a small time delay, at room temperature.

AUTO-IGNITION-TEMPERATURE
The temperature at which combustible materials ignite spontaneously in air.

AUTOMATIC GIMBALLED ANTENNA VECTORING EQUIPMENT AGAVE
A device used to assist in the acquisition of a target by a narrowbeam radar. It can be used, with modifications, as a telemetry receiving antenna.

AUTOMATIC GROUND CONTROL STATION
A concrete structure located beneath the launch pad. It contains a portion of the check-out equipment necessary to perform vehicle prelaunch tests, serves as a distribution point for cables, provides space for vehicle test power equipment, and serves as a distribution point for all high pressure gases.

AUTOMATIC OPERATION
An automatic process in which a series of mechanical actions are caused to occur in a pre-selected pattern or sequence. To be distinguished from automatic control which involves a feedback loop.

AUXILIARY EQUIPMENT
Equipment used in support of a prime equipment but is not permanently attached to prime equipment. Auxiliary equipment is essential for the proper functioning of the prime equipment.

AUXILIARY POWER UNIT APU
A separate electrical or hydraulic power supply unit, either engine or turbine driven, used to furnish the electrical and hydraulic requirements of a spacecraft.

AVAILABLE TIME
Time measured from the correction of a malfunction or the ending of preventive maintenance, to the next succeeding malfunction or the next preventive maintenance action.

AVERAGE LIFE
The mean value for a normal distribution of equipment life-cycle. Generally applied to mechanical failures resulting from wear-out.

AVERAGE OUTGOING QUALITY LIMIT AOQL
The maximum average outgoing quality (AOG) for a sampling plan.

AVERAGE SAMPLE NUMBER ASN
The average number of sample units inspected per lot in reaching a decision to accept or to reject.

AVERAGE TOTAL INSPECTION ATI
The average number of units inspected per lot, including all units in rejected lots (applicable when the procedure calls for 100 percent inspection of rejected lots).

AVIONICS
Contraction of aviation electronics.

AXIS
See—inner gimbal axis
longitudinal axis
outer gimbal axis

AZIMUTH
Horizontal direction or bearing.

B

B/M
Bill of material.

BACK PACK
Self-contained extra-vehicular pressure suit support system.

BACKOUT
Step-by-step reversal of procedures from a specific point during a countdown.

BACKUP ITEM
An additional item under development to perform the general functions of another item under development. The item may be secondary to an identified primary item or a parallel development to enhance the probability of success in performing the general function.

BALLISTIC TRAJECTORY
The trajectory followed by a body being acted upon only by gravitational forces and the resistance of the medium through which it passes.

BALLISTICS
The science or art that deals with the motion, behavior appearance or modification of missiles acted upon by propellants, rifling, wind, gravity, temperature or any other modifying substance, condition or force.
See—exterior ballistics
interior ballistics

BASE LINE DIMENSIONING
The establishment of a group of dimensions from a common base line or datum line. This system eliminates cumulative tolerances that would exist if the dimensions were established in a chain series.

BASELINE CONFIGURATION
The documented and approved design concept or arrangement of components as established at a given point in the procurement cycle for systems or equipment.

BASIC
A term used for identifying a theoretical value, or a dedesired dimension from which limits are derived by the application of an allowance and tolerances.

BASIC DIMENSION
Specified on a drawing as a theoretical value used to describe the exact size, shape or location of a feature. It is used as a basis from which permissible variations are established by tolerances on other dimensions or notes.

BASIC HOLE SYSTEM
A system of fits in which the minimum limit of each hole size is basic. The fit desired is obtained by varying the allowance of the shaft and the tolerances of the mating parts.

BASIC NAME
A single word or a minimum number of words which establishes the basic concept of an item.

BASIC OVERALL POLARITY **BOP**
Refers to the overall system polarity from inertial input to control acturator deflection.

BASIC SHAFT SYSTEM
A system of fits in which the maximum limit of each hole size is basic. The fit desired is obtained by varying the allowance of the hole and the tolerances of the mating parts.

BASIC SIZE
The basic size is that from which the limits of size are derived by the application of allowances and tolerances.

BATTERY
See—gas storage battery

BATTERY CHARGER TEST SET
Equipment which is used to charge and test the space vehicle storage batteries.

BATTERY DISCHARGER TEST SET
Equipment which is used to discharge and check the space vehicle storage batteries and check the battery heater blanket circuitry and thermostat.

BATTLESHIP TEST
Static test program utilizing a partially or completely overdesigned non-flight vehicle to provide performance data on original design and design changes.

BB
Breadboard.

BEAM
A ray or collection of focused rays of radiated energy. Radio waves used as a navigation aid.
See—hypervelocity neutral beam
ion beam neutralization

BEAM-RIDER
A craft following a beam, particularly one which does so automatically, the beam providing the guidance.

BEAST
Colloquial term for a large rocket.

BECO
Booster Engine Cutoff.

BELTS
See–radiation belts
Van Allen belts

BETA SIGNAL OR BETA FEEDBACK SIGNAL
That signal coming from an engine's hydraulic actuator to give an indication of engine deflection.

BI
A prefix meaning two. Occurring every two, as in biennial, appearing every two years, or biweekly, appearing every two weeks. Compare with semi.

BILATERAL TOLERANCE
A tolerance in which variation is permitted in both directions from the design size.

BILL OF MATERIAL
A list of all material and parts used to fabricate a part or assembly. Used for ordering required material. All parts and requirements listed in the B/M shall coincide with those called out on the drawing of the part or assembly.

BINARY NOTATION
A system of positional notation in which the digits are coefficients of powers of the base 2 in the same way as the digits in the conventional decimal system are coefficients of powers of the base 10.

BINARY STAR
Two stars revolving around a common center of gravity.

BIO-SENSOR
Equipment to determine biological reactions, including detectors taped to various parts of man's anatomy, during flights and tests.

BIOASTRONAUTICS
Study of the effects of space flight upon animal or plant life.

BIODYNAMICS
Study of forces acting upon bodies in motion or in the process of changing motion, as they affect living beings.

BIOENGINEERING
The science by which knowledge of properties of matter and sources of power are applied to the design of structures and machines that will be directly used by man.

BIOINSTRUMENTATION
Instrumentation techniques and principles for the measurement of physical, physiological and biological factors in man or other living organisms.

BIOMEDICINE
Combined discipline of biology and medicine for analysis human tolerances to, and protection against, environmental variances.

BIONICS
The study of systems which function after the manner of, or in a manner characteristic of, or resembling, living systems.

BIOPAK
A container for housing a biological organism in a habitable environment, and to record biological functions during space flight.

BIOPOWER SYSTEM
An organic assemblage of living organisms or substances that produce measurable electric potential.

BIOS
Biological Investigation of Space.

BIOSATELLITE
An artificial satellite designed to carry a human, animal or plant for the purpose of a scientific experiment.

BIOTECHNOLOGY
The technology of the relation of man to the products of the industrial technology with which he works, especially in space.

BIOTELEMETRY
The electrical measuring, transmitting, and recording qualities, properties, and actions of organisms and substances, usually by means of radio transmissions from a remote site.

BIRD
Colloquial term for a rocket, satellite, or spacecraft.

BLACK BOX
A component or combination of parts contained in one package so arranged that it can be inserted or removed from its place in a larger system without knowledge of its internal structure.

BLACKOUT
(1) A fadeout of radio communications due to environmental factors such as ionospheric disturbances, or a plasma sheath surrounding a reentry vehicle.
(2) A condition in which vision is temporarily obscured by a blackness, accompained by a dullness of certain of the other senses, brought on by decreased blood pressure in the head and a consequent lack of oxygen. May occur in pulling out of a high-speed dive in an airplane.

BLASTOFF
Colloquial term for launch.

BLEED-CYCLE OPERATION
Refers specifically to those liquid rocket engines in which the turbopump is driven by hot gases bled from the combustion chamber of the main thrust chamber assembly during mainstage operation.

BLOCK DIAGRAM
A line drawing with block outlines to designate units or functional groups for general arrangement studies, functional

explanation, product familiarization, etc., within a system, set or item.

BLOCKHOUSE
Heavily reinforced building designed to withstand blast and heat. It houses the electronic controls and equipment for preparing and launching a vehicle. In Apollo, the term refers to the LCC (Launch Control Center).

BLOW-OUT DISC
A mechanism, consisting of a thin metal diaphragm, used as a safety device to relieve excessive gas pressure.

BLOWOFF
A rudimentary term used to describe the separation of a part of a missile by explosive force for recovery purpose. The term loses significance with the refinements in separation design techniques.

BOATTAIL
The cylindrical section of a ballistic body that continually decreases in diameter toward the tail to reduce overall aerodynamic drag.

BOILERPLATE **BP**
A piece of test hardware, generally non-functioning, which structurally simulates weight, center of gravity, and aerodynamic configuration. It may incorporate interim structural shells or dummy structures. Internal systems may be inert or contain selected functional sub-systems for obtaining flight data for development purposes. A functional mock-up modeled to simulate a subsystem or system for the purpose of evaluating the performance.

BOILOFF
The vapor loss from any volatile liquid (e. g. liquid oxygen) particularly when stored in a vehicle ready for flight.

BOLT
See—explosive bolt

BOLT CIRCLE
The circle locating centers of holes, lugs, etc. Sometimes called pitch circle.

BOMBER
See—orbital bomber

BONDING
Establishment of complete electrical contact between various adjoining structures or units.

BOOSTER
Short for booster engine or booster rocket.
See—two-burn booster

BOOSTER ENGINE
An engine, especially a booster rocket, that adds power to the thrust of the sustainer engine, or provides propulsion for a special phase of flight.

BOOSTER ENGINE CUTOFF **BECO**
The point at which the booster engine stops firing.

BOOSTER ROCKET
(1) A rocket engine, either with solid or liquid fuel, that assists the normal propulsive system or sustainer engine of a rocket or aeronautical vehicle in some phase of its flight. (2) A rocket used to set a missile vehicle in motion before another engine takes over.

BOOTSTRAP
A self-generating or self-sustaining process. Refers specifically to those liquid rocket engines in which, during mainstage operation, the gas generator is fed by the main propellants pumped by the turbopump. The turbopump in turn is driven by hot gases from the gas generator system. Such a system must be started by a starting system which supplies outside power or propellants. When rocket-engine operation is no longer dependent on outside power or propellants it is said to be in "Bootstrap" operation.

BOP TEST
Basic overall polarity test

BORDER
See—aerothermodynamic border
mechanical border

BOUND VECTOR
Vector which has a specific point of application associated with it.

BOUNDARY LAYER
A thin layer of fluid next to the surface of a body in a moving stream (e. g. an airfoil in an airstream) having distinctive flow characteristics as a result of friction between the fluid and the surface of the body.

BP
Boilerplate.

BRAKING
See—atmospheric braking

BRAKING ELLIPSE
An orbital ellipse such that portions of the orbit are within the atmosphere. Its purpose is to decelerate the orbiting body by exposing it to the aerodynamic drag of the atmosphere.

BREADBOARD **BB**
An assembly of preliminary circuits or parts used to prove the feasibility of a device, circuit, system, or principle without regard to the final configuration or packaging of the parts.

BREAKDOWN
See—generation breakdown

BREAKOFF PHENOMENON
The feeling, which sometimes occurs during high-altitude flight, of being totally separated and detached from the earth and human society. Also called breakaway phenomenon.

BREAKUP
See—air breakup

BREMSSTRAHLUNG
Electromagnetic radiation produced by the rapid change in the velocity of an electron or another fast, charged, particle as it approaches an atomic nucleus and is deflected by it.

BRENNSCHLUSS
German for combustion termination. Cessation of fuel burning resulting from consumption of the propellants, deliberate shutoff or other cause.

BRUTE FORCE METHOD
Optimization technique in which the raw data produced by hand calculation or by a computing machine, either as numbers or as cathode ray tube plots, must be compared and evaluated by people to find an optimum point.

BUBBLE COLONY
Colony of persons placed on the Moon or other spatial body provided with individual or group environmental capsules.

BUFFETING
A term often used to describe the vibratory motion of a component or the airframe as a whole which is being subjected to the vibratory impulses contained within an aerodynamic wake.

BUILDING
See—environmental test and service building
gas converter building
vertical assembly building

BUILDING-BLOCK CONCEPT
The assembly of a complex structure by combining standardized and proven sub-assemblies.

BURN POND
A man made pond which contains water a few inches above a mechanical burner vent. The purpose of the pond is to dispose, by burning, of dangerous and undesirable gases such as hydrogen which are vented, purged or dispelled from the space vehicle propellant tanks and ground storage tanks.

BURNOUT VELOCITY
The velocity of the vehicle at burnout.

BUTTON
See—EGADS button

BY-PASS RATIO
In a turbofan engine, the ratio of the air passing through the annular fan duct to the air passing through the compressor, combustion, and turbine section.

C

C&I
Communications and Instrumentation.

C-BAND
Frequencies in the region of 5,000 megacycles per second.

C-1 BLOCK I VEHICLE
Previous designation for Saturn I Block I.

C-1 BLOCK II VEHICLE
Previous designation for Saturn I Block II.

C-1B VEHICLE
Previous designation for Saturn IB.

C-5 VEHICLE
Previous designation for Saturn V.

C/O
Checkout.

CABIN
See—pressurized cabin
sealed cabin

CABIN LEAKAGE
The leakage or loss of spacecraft atmospheric pressure through the various closures, seals, and gasketed apertures in the spacecraft body.

CABLE
See—interconnecting cable

CABLE ASSEMBLY
Consists of two or more conductors with a concentric lay, assembled connectors, and having the protective cover or jacket integral with the cable.

CABLE ASSEMBLY DRAWING
A drawing which shows the complete construction of a cable or a group of cables.

CALCULATED RISK
A risk of known proportions considered to be present if a given action is undertaken, but one deliberately accepted if alternative actions are believed inadequate for attaining the objective, or believed to involve greater risks.

CALENDAR AGE
Age measured in terms of the time from manufacture of the object.

CALIBRATE
To make careful adjustment, to achieve a given standard of accuracy.

CALIBRATION
Comparison between two instruments or devices, one of which is a standard of known accuracy, to detect and to correlate or adjust any variation in the accuracy of the instrument being compared.
See—final calibration curve
stage calibration equipment

CALIBRATION TEST
Tests to determine the output characteristics of a measuring device, component or assembly and to see if the characteristics are within specification.
See—laboratory calibration test
vehicle calibration test

CALLOUT
A note or instruction on the face of drawing which clearly designates, by arrow or description, the portion of the drawing to which it refers.

CANNIBALIZATION
A maintenance modification or repair method in which the required parts are removed from a similar system or assembly for installation on another.

CAPE CANAVERAL
Cape on the East Coast of Florida used as a laboratory for launching missiles and space vehicles. It is operated by the Air Force Missile Test Center.

CAPSULE
A sealed, pressurized cabin with an acceptable environment. Usually for containing a man or animal for extremely high-altitude flights, orbital space flight, or emergency escape.
See—ejection capsule

CAPTIVE TEST
A static or hold-down test of a rocket engine, stage or motor. Distinguished from a flight test.
See—static testing

CARD
See—aperture card

CARDIOVASCULAR REACTIVITY
The response and function of heart and blood vessels to various types of stress such as exercise, acceleration, heat, and cold.

CASSEGRAIN MICROWAVE OPTICS
A method of placing the antenna feed away from the prime focus of the antenna, wherein the feed again reflects the waves reflected by the antenna, intensifying the strength of the waves.

CATALYST OR CATALYTIC AGENT
Any substance which, by virtue of its presence, affects the rate of a chemical reaction and which may be recovered practically unchanged at the end of the reaction.

CATAPULT
A mechanical structure which, by its action, provides an accelerating force to an air vehicle, and which at the same time provides directional constraint during the launching.

CATASTROPHIC FAILURE
A sudden failure without warning, as opposed to degradation failures. Such failures occur suddenly within the operational time period after all efforts have been made to eliminate design defects and unsound components and before any forseen wearout phenomena have time to appear.

CAVITATION
Rapid formation and collapse of vapor pockets in a flowing fluid under very low pressures. A frequent cause of structural damage to rocket components.

CAVITY REACTOR
A conceptual nuclear propulsion reactor in which the fuel is in a gaseous state and is suspended and separated from the propellant by centrifugal or gasdynamic means.

CBA
Cocoa Beach Apollo.

CCP
Contract Change Proposal.

CCS
Change Control System.

CDU
Coupling Display Unit.

CELESCOPE
Telescope and spectroscope payload for orbiting astronomical observatory (OAO).

CELESTIAL GUIDANCE
The guidance of a missile or vehicle by reference to celestial bodies.

CELESTIAL MECHANICS
The study of the theory pertaining to the motions of celestial bodies under the influence of gravitational fields.

CELESTIAL NAVIGATION
Onboard navigation using the celestial bodies for reference. Celestial guidance.

CELESTIAL SPHERE
Imaginary sphere of infinite radius, assumed for navigational purposes, the center of which coincides with the center of the Earth.

CELL
See—electro-chemical cell
fuel cell
solar cell

CENSORED SAMPLE
Some of the items removed from observation before they fail. The total number of sample specimens is known, but measurements on some of this number are lacking.

CENTER
See—Ames Research Center
Arnold Engineering and Development Center
Control Center
electronic data processing center
Flight Research Center
Goddard Space Flight Center
Langley Research Center
launch operations center
Lewis Research Center
Manned Spacecraft Center
Marshall Space Flight Center

CENTER OF GRAVITY **CG**
For an extanded body or collection of particles subject to gravitation, the point through which the resultant force of gravity acts no matter how the body is oriented.

CENTER OF MASS **CM**
The point in a body at which the entire mass of the body can be considered to be concentrated.

CENTRIFUGAL FORCE
A force directed away from the center of rotation in a rotating system.

CENTRIFUGE
Specifically, a large motor-driven apparatus with a long arm at the end of which human and animal subjects or equipment can be revolved and rotated at various speeds to simulate the prolonged accelerations encountered in a high-performance aircraft, rockets, and spacecraft.

CENTRIPETAL FORCE
A force directed toward the center of rotation of a rotating system.

CFE
Contractor Furnished Equipment.

CFP
Contractor Furnished Property.

CG
Center of Gravity.

CHAMBER
See—environmental space chamber
firing chamber
ion chamber

CHANCE FAILURE
A failure which occurs at random within the operational time of an equipment after all efforts have been made to eliminate design defects and unsound components, and before wearout becomes predominant.

CHARGE
See—electrostatic charge

CHASSIS
That portion of an assembly that is the basic frame upon which stiffening members, brackets, gussets, subassemblies, and components, are mounted.

CHECK-OUT TIME
Time required to determine whether the performance characteristics of a system are within specified values.

CHECKING LAYOUTS
Accurate layouts of checked details and assemblies drawn in the proper order of assembly to assure the proper fitting of all parts. When drawing parts, consideration is given to the most critical variations of the parts.

CHECKLIST
A list of procedures or items summarizing the activities required for an operator or technician in the performance of his duties. A condensed guide. An on-the-job supplement to more detailed job instructions.

CHECKOUT C/O
A test or procedure for determining whether a person or device is capable of performing a required operation or function. When used in connection with equipment, a checkout usually consists of the application of a series of operational and calibrational tests in a certain sequence, with the requirement that the response of the device to each of these tests be within a predetermined tolerance. For personnel, the term checkout is sometimes used in the sense of a briefing or explanation to the person involved, rather than a test of that person's capability.
See—horizontal pre-flight checkout system
spacecraft operations and checkout facility
vehicle horizontal checkout
vehicle vertical checkout

CHECKOUT EQUIPMENT
Electric, electronic, mechanical, and pneumatic equipment, both automatic or manual, which is required to perform the checkout function of engines, systems, or stages.

CHEMICAL FUEL
A fuel depending upon an oxidizer for combustion or for development of thrust, such as liquid or solid rocket fuel, jet fuel, or internal-combustion engine fuel. Distinguished from nuclear fuel.

CHEMICAL ROCKET
A rocket using chemical fuel, which requires an oxidizer for combustion, such as liquid or solid rocket fuel.

CHEMILUMINESCENCE
Light produced through chemical reactions.

CHEMOSPHERE
The vaguly defined region of the upper atmosphere in which photochemical reactions take place.

CHI-SQUARED FUNCTION
A gamma function that expresses a distribution of many independent standardized variables. The form of the chi-squared function differs for each number of degrees of freedom. Chi-square is the sum squares of independent normal variates divided by their common variance.

CHOKES
A form of decompression sickness believed to be due to the evolvement of gases in the lung tissue upon ascent to altitude. It is characterized by a deep substernal pain or burning sensation, difficulty in respiration, and a non-productive cough.

CHROMOSPHERE
One of the atmospheric shells of the Sun, lying above the photosphere and best visible at time of total eclipse. Can be observed spectroscopically at other times.

CHUFFING
A noise resulting from a combustion instability, especially in a liquid-propellant rocket engine, characterized by a pulsing operation at a low frequency.

CHUGGING
Same as chuffing.

CIRCADIAN RHYTHM
A particular regular recurrence or alteration in features, elements, and phenomena of living organisms.

CIRCUIT
A group of elements or parts, connected and related so as to perform a specific function in a component, assembly, or system.
See—passive circuit

CIRCULAR ORBIT
An orbit which describes a complete constant altitude revolution around the Earth.

CIRCULAR VELOCITY
The speed required to maintain a body in a circular orbit.

CIRCUMLUNAR
Specifically, around the Moon. Generally this term has become associated with the program missions in which a spacecraft will circle the Moon one or more times and return to Earth.

CIRCUMLUNAR TRAJECTORY
A trajectory programed to orbit the spacecraft one or more times around the Moon.

CIRCUMPLANETARY SPACE
Space relatively close to a planet, especially the space close to the Earth, including the outer reaches of the atmosphere.

CISLUNAR
Of or pertaining to space between the Earth and the orbit of the Moon, or to a sphere of space centered on the Earth with a radius equal to the distance between the Earth and the Moon.

CLASS 1 DRAWING
Government design activity drawings which are furnished or prepared in accordance with MIL-D-70327 as Government agency drawings by a Government design activity or a contractor and for which the Government agency retains or assigns responsibility for the preparation of maintenance. These drawings are assigned a Government identification code and drawing numbers from a block of numbers issued by a Government activity.

CLASSIFICATION OF DEFECTS
The enumeration of possible defects of the unit of product classified according to their importance.

CLEARANCE
The space between mating parts.

CLEARANCE FIT
One having limits of size so prescribed that clearance always results when mating parts are assembled.

CLIMATIC ENVIRONMENTS
Environments consisting of ambient atmospheric conditions such as degree of vacuum, radiation, and temperature.

CLIMATIZATION
All measures taken to provide for the satisfactory operation, packaging, transportation, and storage of ground equipment regardless of climatic conditions.

CLOSE ABOARD MODE
One of the modes of operating the sextant to obtain a fix on a star and a landmark to determine position in space, while in orbit.

CLOSED ECOLOGICAL SYSTEM
A system that provides for the maintenance of life in an isolated living chamber, such as a spacecraft cabin, by means of a cycle wherein exhaled carbon dioxide, urine, and other waste matters are converted chemically or by photosynthesis into oxygen, water, and food.

CLOTH PRINT
A photo reproduction image on a woven fiber base.

CLUSTER
Two or more engines bound together so as to function as one propulsive unit.

CLUTCH (DIRECTIONAL)
Device for transmitting a driving force in either of two directions.

CLUTCH (SEPARATING)
A device for disengaging a driven member with the driving power.

CLUTCH (SLIP)
A device which permits the driving force to be partially relieved of the driven load.

CM
Command Module.
Center of Mass.

CM CENTER STATION
The middle crew position in the command module (CM), from which the navigator can assist the commander and the systems manager in any of their functions during launch and reentry.

CM CONTROL STATION
The left-hand crew position in the command module (CM), from which the commander normally monitors and controls all flight.

CM NAVIGATION STATION
The crew position located in the lower aft equipment bay of the command module (CM) from which the navigator aligns the IMU, makes navigational fixes, monitors delta velocity maneuvers and the IFTS panel, and performs maintenance for the guidance and navigation system.

CM SYSTEM MANAGEMENT STATION
The right-hand crew position in the command module (CM) from which the systems manager normally monitors and controls the operating condition of all spacecraft systems.

CMPT
Component.

CO
Sometimes used as abbreviation for checkout. Use of the preferrable C/O will avoid confusion with the abbreviation for company.

COLD GAS ATTITUDE CONTROL SYSTEM
A vehicle stabilization system using the expulsion of a cold inert gas under high pressure to provide motive force.

COLD-FLOW TEST
Test of a liquid rocket without firing, to check efficiency of a propulsion subsystem that provides for the conditioning and flow of propellants, including tank pressurization, propellant loading, and propellant feeding.

COLLIMATION TOWER
A tower used to mount electronic and optical targets which are used to determine and check proper alignment of an antenna.

COMBINED MISSION ENVIRONMENTS
The simultaneous application of climatic and dynamic environments expected during the operational cycle of equipment.

COMBINED STRESS
The stresses resulting from the simultaneous action of such factors as primary stresses, secondary stresses, and thermal stresses.

COMBUSTIBLE
Any material or structure which can burn. A relative term. Many materials will not burn in one state but will in another. E. g., steel will burn, structural steel will not.

COMBUSTION
A chemical process characterized by the evolution of heat. Commonly, the chemical reaction of fuel and oxidizer, but by extension includes the decomposition of monopropellants and the burning of solid propellants.

COMBUSTION INSTABILITY
Unfavorable, unsteady or abnormal combustion of fuel, especially in a rocket engine, e. g., unfavorable combustion oscillation.

COMBUSTION OSCILLATION
High frequency pressure variations in the combustor. Combustion oscillation is caused by uneven propellant consumption.

COMET
A luminous member of the solar system composed of a head or coma at the center of which a presumable solid nucleus is sometimes situated, and often with a spectacular gaseous tail extending a great distance from the head.

COMM
Communications.

COMMAND
A signal which initiates or triggers an action in the device which receives the signal.

COMMAND DESTRUCT
A system which destroys the vehicle, actuated on command of the range safety officer whenever vehicle performance degrades enough to be a safety hazard.

COMMAND DESTRUCT SIGNAL
A radio signal that detonates an explosive in a rocket, missile or vehicle so as to destroy it.

COMMAND MODULE **CM**
The portion of the spacecraft which houses the crew, serves as the center for crew-initiated command functions and is the recoverable portion of the spacecraft.

COMMAND AND SERVICE MODULE **CSM**
Combination of the command module (CM) and the service module (SM) that remains when the lunar excursion module (LEM) is separated for lunar descent or return to Earth.

COMMAND MODULE SIMULATOR
An auxiliary device for testing the service module (SM) systems with the service module and command module (CM) unmated. The simulator includes subsystems and components to generate and receive electrical signals for performing checkout functions.

COMMANDER
The first member of the Apollo flight crew. The spacecraft commander occupies the control station on the left side, which is a couch facing the main panel. He has primary cognizance of those controls and displays requiring time-critical response to insure crew safety and mission success. Under normal circumstances, his activity encompasses flight mode selection, implementation of navigation and guidance, and monitoring operational or exploration direction. He also serves as the commander of the lunar excursion module (LEM).

COMMERCIAL ITEM
Supplies or services which normally are offered and sold to the public commercially by any supplier.

COMMON HARDWARE
Expendable hardware items having multiple applications, E. g., nuts, bolts, screws, washers, pins, keys, and grommets.

COMMUNICATIONS **COMM**
A method or means of conveying information of any kind from one person or place to another. In aerospace application, communications generally means the voice and data links employed during any phase of the launch and flight operations either by hardwire or RF. Included are telephone systems, TWX's, television, radio transmission, commutated UHF, telemetry, lasers, etc.

COMMUNICATIONS SATELLITE
A satellite designed to reflect or relay electromagnetic waves used in the communications media.

COMPANION BODY
A nose cone, last-stage rocket, or other body that orbits along with an earth satellite.

COMPARISON INSPECTION
The examination and testing performed at intervals, on samples representative of production runs, after the supplies or services have passed the qualification inspection.

COMPATIBILITY
A characteristic ascribed to a major subsystem that indicates it functions well in the over-all system.

COMPLETE INTERCHANGEABILITY
The ability to interchange without restriction.

COMPLETE OPERATING EQUIPMENT
An equipment together with the necessary parts, accessories, and components, or any combination thereof, required for the performance of a specified operational function.

COMPLEX
Entire area of launch site facilities. This includes blockhouse, launchpad, gantry, etc. Also referred to as a launch complex.

See—ground computer complex
liquid hydrogen (LH-2) system complex
liquid oxygen (LOX) system complex
RP-1 fuel system complex

COMPONENT CMPT
An article which is normally a combination of parts, subassemblies, or assemblies and is a self-contained element within a complete operating equipment.

COMPONENT ACCEPTANCE TEST
Acceptance test of an individual component (consisting of a number of parts) to determine if these components will meet specifications prior to assembly in a subsystem.

COMPONENT AND PART RELIABILITY
A component or part is reliable when it will operate to a predetermined level of probability under its maximum ratings at most severe combination of enviroments for which it was designed and for the length of time or number of cycles specified.

COMPONENT DRAWING
Mechanical or electrical drawing providing necessary information for fabrication and testing of a specific component.

COMPONENT STRESS
The stresses on component parts are those factors of usage or test which tend to affect the failure rate of these parts. This includes voltage, power, temperature, frequency, rise time, etc. However, the principal stress, other than electrical, is usually the thermal-environmental stress.

COMPOSITE MATERIALS
Structural materials of metal alloys or plastics with built-in strengthening agents which may be in the form of filaments, foils, or flakes of a strong material.

COMPOSITE PROPELLANT
A solid rocket propellant consisting of an elastomeric fuel binder, a finely ground oxidizer, and various additives.

COMPRESSED GAS CYLINDERS
Any tubes, bottles, or other type of pressure cylinders used for the purpose of storing or transporting liquids or gases under pressure.

COMPUTED RELIABILITY
The synthetic calculated probability of a system performing its purpose within specifications based on estimates or tests of the reliability of its components.

COMPUTER
A machine for carrying out calculations and performing specified transformations on information.
See—analog computer
Apollo Guidance Computer
digital computer
hybrid computer
real-time computer

CONCENTRICITY
A condition wherein the axis of one symmetrical feature coincides with the axis of one or more other symmetrical features within a part or assembly.

CONCEPT
See—anticriticality concept
building-block concept
integration, transport and launch concept

CONCEPTUAL PHASE
That period in the system life cycle which usually terminates with publication of a specific operational requirement.

CONDITIONING
The exposure of sample units or specimens to a specific environment for a specified period of time to prepare them for subsequent inspection.

CONFIDENCE FACTOR
The percentage figure that expresses confidence level, or proportion of times the statement should be correct.

CONFIDENCE INTERVAL
A range of values estimated from a random sample on the premise that the range will include a sought-for true parameter if the sampling process were to be repeated many times.

CONFIDENCE LEVEL
The percentage of statements, tests, etc., expected to be correct. The certainty with which data from a small group apply to a specific confidence interval. By using appropriate data and a selected confidence coefficient, the expected correct answers can be obtained.

CONFIDENCE LIMITS
The upper and lower extremes of the confidence interval.

CONFIG
Configuration.

CONFIGURATION CONFIG
The technical and physical description required to fabricate, test, accept, operate, maintain and logistically support systems or equipment.

CONFIGURATION ACCOUNTING
Act of documentating proposed and approved changes made to systems and equipment in order to maintain knowledge of configuration status.

CONFIGURATION CONTROL
Systematic evaluation, coordination, approval or disapproval of all changes to the baseline configuration.

CONFIGURATION IDENTIFICATION
The technical documentation defining the approved configuration of systems or equipment under development, test, and production.

CONNECTION DIAGRAM
A diagramatic drawing that shows physical arrangement of items in an assembly or system, and also the connections between the items. An electrical wiring diagram is, for instance, one type of connection diagram.

CONSOLE
Contains controls and indicators for the monitoring and control of a particular sequence of actions, as in the checkout of a rocket, countdown action, or a launch procedure.

CONSTRAINT
Limit beyond which a variable cannot be permitted to vary under any condition.

CONSTRUCTION DRAWING
An engineering drawing that illustrates the design of buildings and structures, including complete facilities.

CONSUMABLES
Parts and materials of both contractor and Government furnished origin expended in the course of performing maintenance or operational objectives.

CONSUMER'S RISK
The probability of accepting an item which is, in fact, unsatisfactory.

CONTACT IONIZATION
Ionization caused by contact with a surface, either because of the high surface temperature or the catalytic effect of the surface.

CONTACT PAPER
Photographic paper designed to be exposed when directly in contact with a reproducible document.

CONTACT PRINT
A reproduction made by exposure of sensitized material by direct contact with that which is to be copied.

CONTR
Contractor.

CONTRACT
A legally binding document executed by the Government and the prime contractor which, in addition to the terms and conditions thereof, includes by reference or otherwise, specifications, drawings, exhibits and other data necessary to its proper performance.

CONTRACT SCHEDULE
That portion of a Government prime contract which describes the articles or services desired. Not to be confused with contract time-schedule or delivery schedule.

CONTRACTING OFFICER
Any officer or civilian employee authorized to enter into and administer contracts and to make determinations and findings with respect thereto.

CONTRACTOR
Individuals or concerns who enter into a prime contract with the Government.

See—associate contractor
prime contractor
principal contractor

CONTRACTOR FURNISHED EQUIPMENT CFE
That portion of contractor-furnished property which is included in the system by the contractor.

CONTRACTOR FURNISHED PROPERTY CFP
That property, other than Government property, used by the contractor in the performance of a contract.

CONTRACTUAL COVERAGE
The coverage of a legally binding document which requires the contractor to satisfy government requirements for supplies or services defined by such document.

CONTROL

See—configuration control
control center
operational flight control
orientation control
program control
quality control
reaction control facility
reliability control
thrust vector control
vector control

CONTROL CENTER

See—launch control center
mission control center
simulation control center
vehicle propellant loading control center

CONTROL JET
Synonym for attitude control propulsion motor (ACPM).

CONTROL RATIO
The relationship between the movement of a control and the movement of that which is controlled.

CONTROL ROCKET
A vernier rocket, ullage rocket, retrorocket, or other such rocket, used to guide, accelerate, or decelerate a space vehicle.

CONTROL SURFACE REVERSAL
The change in the direction of the lift increment from that normally produced by deflecting a movable control surface. It results from the torsional deflection of the fixed surface caused by the aerodynamic moments applied when the movable control surface is deflected.

CONTROL SYSTEM
A system in a missile or space vehicle that serves to maintain attitude stability during powered flight and to correct deflections caused by gusts or other disturbances.

See—addaptive control system
attitude-control system
cold gas attitude control system
enviromental control system
ground environmental control system
guidance and control system
pneumatic control system
reaction control system

CONTROLLED LEAKAGE SYSTEM
A system that provides for the body's metabolism, in an aircraft or spacecraft cabin, by a controlled escape of carbon dioxide and other waste from the cabin, with replenishment provided by stored oxygen and food.

CONTROLLED PROCESS
A process which yields samples whose characteristics remain consistently within the control limits of a shewhart chart.

CONTROLLED TEST
A sampling method designed to solve a problem or group of problems concerning a given product.

CONTROLS
Those parts of the equipment which are provided for the operator's use in order to effect changes in the equipment performance.

CONVECTIVE HEATING
The exchange of heat energy between a body and the fluid or gas passing over it.

COOLING
See—film cooling
regenerative cooling
sweat cooling

COOLING SYSTEM
The system which prevents excessive temperatures of accessories, equipment, components, and structure.

COOPERATIVE RENDEZVOUS
Rendezvous using both radar and optical tracking methods.

COORDINATED PLANNING
The over-all detail planning and agreement between engineering, manufacturing, and other interested functions. Preferably incorporated in drawings prior to initial issue.

CORIOLIS FORCE
Deflection of a projectile during its flight across the earth's surface, caused by the rotation of the earth.

CORIOLIS REACTION
A mixed sensory illusion (eyes and semicircular canals) of the oculogyral type where in if a pilot while in a spin moves his head in the opposite direction, resultant fluid movement in the canals produces severe vertigo, (dizziness, nausea, pallor, etc).

CORONA
The faintly luminous outer envelope of the sun. Also called solar corona.

CORONAGRAPH
Device to scan and record the solar corona.

CORRELATION
The degree to which two or more variables are so related that a change in one is accompanied by a corresponding change in the other. The degree of concomitance is measured by the correlation coefficient.

CORROSION
See—destructive corrosion

COSMIC DUST
Small meteoroids of a size similar to dust.

COSMIC RAYS
The extremely high-energy subatomic particles which bombard the atmosphere from outer space. On colliding with atmospheric particles they produce many different kinds of lower-energy secondary cosmic radiation.
See—primary cosmic rays
secondary cosmic rays

COSMOS
Totality of the observed and postulated physical universe.

COSPAR
Committee on space research of the international council of scientific unions, to which the United States belongs through the National Academy of Sciences.

COUNTDOWN
The step-by-step process leading to a launch. It is performed in accordance with a predesigned time schedule, measured in terms of T-time (T minus time prior to initiation of engine start sequence and T plus time thereafter).

COUPLED SERVO FLUTTER
A low frequency oscillation of the airframe structure, caused by feedback (through the airframe or the air) of the structural and rigid body vibrations of servomechanisms located within the airframe, causing actuation of the space vehicle controls in response to the vibrations.

COUPLING DISPLAY UNIT **CDU**
An assembly of electromagnetic transducers and gears with a display readout. The CDU presents coordinated data from the subsystems included in Apollo guidance and navigation equipment (AGE). Provisions are also made to manually set-in inertial orientation for emergency modes of operation.

CRAWLER-TRANSPORTER
The prime mover used to position the launcher umbilical tower (LUT) in the vertical assembly building (VAB), move the LUT/SV configuration from the VAB to the launch pad, and move the arming tower from its park position to the pad. The crawler-transporter will be 131-feet long and 114-feet wide, and will contain two diesel generators which provide 5600 hp for the electric drive motor system. It will move on four double-tracked crawlers, with hydraulic jacking pads on 90-foot centers.

CRAWLERWAY
A specially prepared dual roadway providing access for the crawler-transporter to the launch pads, arming tower parking areas, and the vertical assembly building (VAB). The roadway will be designed to support 17.5 million pounds. The two lanes will be spaced on 90-foot centers to match the tractor units, and each lane will be 40-feet wide. The crawlerway will have a 5% grade approaching each pad.

CREW
A group of specialists who perform simultaneous and sequential duties and tasks involved in the accomplishment of an assigned operation.
See—flight crew

CREW SAFETY
Safe return of all three crew members whether or not the mission is completed.

CREW SAFETY PROBABILITY
The probability of crew return without exceeding prescribed emergency limits.

CREW SAFETY SYSTEM
Consists of the necessary sensors, test equipment, and displays, on board the spacecraft to detect and diagnose malfunctions, and to allow the crew to make a reasonable assessment of the contingency. For emergency conditions, the CSS is capable of initiating an abort automatically.

CRITICAL AND LIMITED LIFE ITEM REFURBISHMENT
Periodic rework or partial replacement of items having a critical function or a limited life after a failure has occurred on such items.

CRITICAL DEFECT
A defect that judgment and experience indicate could result in hazardous or unsafe conditions for individuals using or maintaining the product, or result in failure in accomplishment of the ultimate objective.

CRITICAL DESIGN REVIEW
The comparative evaluation of worth of parameters, such as producibility, time, schedule, cost, weigh, geometric space envelope, performance, reliability, and maintainability, in order to achieve optimum over-all system effectiveness.

CRITICAL FAILURE
Any failure which results in mission loss, but which allows crew initiation of the escape sequence.

CRITICAL FLIGHT EXPERIMENTS
Those flight experiments which determine the feasibility of a concept.

CRITICAL ITEM
The classification of an item according to its strategic value to an operation or mission.

CRITICAL PARTS LIST
A listing of those parts whose failure would cause a degradation in mission success or crew safety.

CRITICAL PATH
That particular sequence of activities that has the greatest negative or least positive activity slack.

CRITICALITY
Assignment of relative importance to hardware or systems.

CRITICALITY FACTOR
See—importance factor

CRYOGENIC
An adjective referring to low temperatures, usually those at which gases become liquid.

CRYOGENICS
The science of low-temperature conditions.

CRYOGENIC GYRO
A magnetically supported gyro using super conductive metals associated with very low fluid temperatures to maintain the magnetic field.

CRYOGENIC PROPELLANT
A rocket fuel, oxidizer, or propulsion fluid which is liquid only at very low temperatures.

CSM
Command and Service Module

CUMULATIVE DISTRIBUTION FUNCTION
The probability that a random variable takes on any value less than or equal to its stated value.

CURTAILED INSPECTION
Sampling inspection where, as soon as a decision is certain, the inspection of the sample is stopped. As soon as the rejection number for defectives is reached no further inspection is necessary. A first sample is always completed for the purpose of estimating the process average quality.

CURVE
See—final calibration curve
synergic curve

CUTOFF
The cessation of burning in a jet or rocket engine owing to an intentional command action. Distinct from burnout which signifies a cessation of burning because of the exhaustion of the fuel.
See—rough combustion cutoff

CYCLE
See—liquid-air cycle engine
operating cycle
sunspot cycle

CYLINDERS
See—compressed gas cylinders

CYTHEREAN ATMOSPHERE
The atmosphere of Venus.

CYTO-CHEMICAL
Chemical aspects of the structure, function, multiplication, pathology, and life history of living cells.

D

D&C
Display and Control.

D-REGION
Region of absorbing ionization considered to exist as a consequence of particle radiation from hydrogen bursts of the Sun, bringing about complete inhibition of short-wave communication, but some improvement in long-wave communication.

DATA FIELD
One or more columns on a tabulating or aperture card that are reserved for specific information entered in a specified manner.

DATA REDUCTION
Transformation of observed values into useful, ordered, or simplified information.

DATUM ELEMENTS
Datum parts, lines, and surfaces are features assumed to be exact for purposes of computation or reference and from which the location of other features may be established.

DATUM FEATURE
One of a group of features whose function is to act as a reference for the other features in the group.

DDAS
Digital Data Acquisition System.

DEAD MAN CONTROLS
Devices for shutting off or rendering mechanisms safe in case of accident or illness of the operator.

DEBUGGING
A reliability conditioning procedure which is a method of aging the equipment by operating it under specified environmental and test conditions in accordance with an established procedure in order to eliminate early failures and age or stabilize the equipment prior to final test and shipment. Also known as burn-in or infant mortality.

DEC
Deceleration.

DECELERATION **DEC**
Negative acceleration (slowing down).

DECISION DEVICE
The device which determines which branch of a standby redundant system will be used.

DECLINATION
Angular distance north or south of the celestial equator. The arc of an hour circle between the celestial equator and a point on the celestial sphere, measured through 90 degrees, and labeled N or S to indicate the direction of measurement.

DECOMPRESSION SICKNESS
A disorder in the body caused by reduced barometric pressure and evolved or trapped gas bubbles in the body, marked by pain in the extremities, occasionally leading to severe central nervous system and neurocirculatory collapse.

DEEP SPACE INSTRUMENTATION FACILITY **DSIF**
A combination of three radar and communications stations in the United States, Australia, and South Africa so located as to keep a spacecraft in deep space under observation at all times.

DEFECT
Any nonconformance of the unit of product with specified requirements.

DEFECTIVE
See—percentage defective

DEFLECTOR
See—launcher deflector

DEGRADATION
Gradual deterioration in performance.

DEGRADATION FACTOR
The factor by which reliability is changed due to treatment of the equipment such as manufacture, maintenance, etc.

DEGRADATION FAILURE
A failure that results from a gradual change in performance characteristics of an equipment or part with time.

DEI
Development Engineering Inspection

DELINEATION (GRAPHIC)
The lines which represent the form, outline, or contours of the object as differentiated from the dimensions, notes, or other nonpictorial representation or description of the part or its details.

DELTA
3-stage launch vehicle using THOR first stage (also called THOR-DELTA).

DELUGE COLLECTION POND
A pond at the launch site that collects water used to cool the flame deflector. Called "Skinner Basin".

DEPENDENT VARIABLE
Variable whose value is determined by fixing the values of all the independent variables.

DEPTH OF FIELD
That area of tolerance where in the distance from lens to document can vary and still be considered in sharp focus.

DERATING
A reduced level of application relative to designed capability.

DESICCANT BANK
A device used to filter hydrocarbons and water vapor from gaseous fluids such as nitrogen. It may be used in a high pressure gas storage system.

DESIGN DSGN
As applied to a product, it is the engineering drawings and specifications which permit fabrication of the product.
See—critical design review
factorial design
fail-safe design

DESIGN ACTIVITY
Activity having responsibility for the design, preparation, and maintenance of engineering drawings for a given item of supply.

DESIGN BURST PRESSURE
The maximum relief valve pressure, or maximum operating pressure, plus hydrostatic head (if applicable), multiplied by the appropriate ultimate factor of safety.

DESIGN CRITERIA
Standards upon which a design is based.

DESIGN LAYOUT
A final approved layout of a product or apparatus declared suitable for manufacture.

DESIGN LOAD
The limit load multiplied by the required minimum factor of safety.

DESIGN RELIABILITY
The reliability inherent in the design. Generally, the maximum reliability that can be achieved if all equipment is produced, maintained, and operated exactly as specified. It is determined by the selection and application of materials, parts, and circuits and related to the application of environmental and operational stress.

DESIGN RELIABILITY ASSURANCE
The function of ensuring that all design disciplines that contribute to reliability have been followed.

DESIGN RELIABILITY CREATION
The function of applying recognized disciplines for reliability achievement during the actual design phase.

DESIGN REVIEW
A progressive review, starting after the design study and continuing through the prototype stage. Provides an assessment of reliability and reliability trends by use of applicable tests and prediction techniques.

DESIGN SIZE
A size from which the plus or minus limits of size are derived by the application of tolerances. When there is no allowance the design size is the same as the basic size.

DESIGN STRESS LEVEL
The maximum anticipated operating stress encountered over the expected life of the equipment. This level is defined as not including safety factors or safety margins.

DESIGN STUDY
The phase during which the initial study and layout of the system, major combination, or item is made. It concludes with the preparation of drawings adequate for the initiation of design and fabrication of a mock-up.

DESTINATION INSPECTION
The inspection performed at the receiving point of the consignee of material to ascertain whether the shipment is in conformance with purchase specifications.

DESTRUCT
The action of detonating or otherwise destroying a vehicle after it has been launched, but before it has completed its course. Usually for reasons of safety.
See—command destruct
command destruct signal

DESTRUCTIVE CORROSION
Any type of corrosion which, in any way, interferes with mechanical or electrical performance.

DESTRUCTIVE TESTING
Testing of any nature which may materially affect the life expectancy of the item tested, whether or not failure occurs during the test.
See—mono detail drawing
multi detail drawing

DETAIL ASSEMBLY DRAWING
A drawing wherein some items are depicted in detail on the drawing in lieu of preparing separate detail drawings.

DETAIL DRAWING
Delineates information to describe an item, and shall include materials, finish, tolerances, and other requirements as applicable.

DETAIL PART
An article which is an element of a subassembly, minor assembly, or installation (complete equipment), and is of such simple or inexpensive construction that it is neither practical

nor economical to further disassemble for maintenance purposes.

DETAIL SPECIFICATION
A detail description of a particular model of an item prepared by the designer which cites all specific design and construction criteria.

DEV
Deviation.

DEVELOPMENT
The application of known techniques and principles to produce a desired result from the discoveries of research. In the development stage a device is visualized and its performance is anticipated. Development is characterized by deliberate planning, by ingenuity, and by synthesis of knowledge in many fields. The result of development is the creation of plans or models for a new device, and the demonstration by test that the prototype of the device fulfills the objective of the development.

DEVELOPMENT DATA
The data to be submitted after award of a contract for the development of a system with operational configuration for service evaluation.

DEVELOPMENT ENGINEERING INSPECTION **DEI**
Inspection conducted to evaluate plans and insure that design objectives are being accomplished with respect to producibility, performance, all-weather capabilities, safety, ease of operation, reliability, maintainability, and other criteria.

DEVELOPMENT ENGINEERING TEST
The phase during which the proper function of the components of the system, in relation to one another, is assured. It includes the development engineering test of the prototype, necessary redesign and testing, modification of drawings and specifications.

DEVELOPMENT MODEL
A model designed to meet specified performance requirements or to establish technical requirements for production items.

DEVELOPMENT TEST
Test employed to generate engineering knowledge concerning a design or piece of equipment. Development testing will be used to determine and verify safety margins and explore modes of failure.

DEVELOPMENT TESTING AND EVALUATION
Conducted to determine if theories, techniques, and material are practicable, or if equipment and component items are technically sound, reliable, safe, and meet established specifications or requirements.

DEVELOPMENT VEHICLE
A vehicle whose primary planned and programmed purpose is for flight test of the vehicle under development as distinguished from the primary objective of launching satellites or other payloads.

DEVIATION **DEV**
A specific authorization, granted before the fact, to depart from a particular requirement of specifications or related documents.
See—standard deviation

DEWAR
A multiple-wall, highly-insulated container for storing cyrogenic liquids such as liquid hydrogen. Constructed much in the manner of the familiar "thermos" vacuum bottle.

DF
Direct Flight.

DIAGRAM DRAWING
A drawing that delineates by symbols the features and relationships of items and systems.
See—connection diagram
interconnection diagram
logic diagram
schematic diagram

DIELECTROPHORESIS
The motion of electrically neutral bodies in a nonuniform electric field.

DIELECTROPHORETIC PROPELLANT ORIENTATION
In theory, the use of dielectrophoresis at zero gravity in which non-uniform electric fields can be produced in liquid propellant tanks by the addition of an electrode and a high voltage power supply. The propellant tank acts like a giant condenser with high voltage, but no current flow, between the electrodes. Propellant globules are then collected to a desired location by applying the electric field.

DIGITAL COMPUTER
A computer which operates on the principle of counting as opposed to measuring.
See—analog computer

DIGITAL DATA ACQUISITION SYSTEM **DDAS**
A system used for instrumentation hardwire checkout. The stage part of this system consists of time division multiplexers, an electronic scanning switch, and an A-D converter. The ground equipment consists of the digital decoding required to present data words to the LCC for evaluation.

DIMENSION
A numerical value expressed in appropriate units of measure and indicated on drawings with lines, symbols, and notes to define the geometrical characteristics of an object.
See—angular dimensioning
base line dimensioning
basic dimension
form dimension
gage dimension
limit dimensioning system
limits of a dimension
location dimension
progressive base line dimensioning
rectangular dimensioning
reference dimension
size dimension

DIPLEXER
A device permitting an antenna system to be used simultaneously or separately by two transmitters. Compare with duplexer.

DIRECT ASCENT
A boost trajectory that goes directly to the final burnout conditions and the coast trajectory without requirements for a parking orbit or staging location.

DIRECT FLIGHT
A mode that accomplishes a mission without rendezvous or combination after leaving the earth's surface.

DISC
See—blow-out disc

DISCONNECTS
See—fly-away disconnects

DISH
A parabolic type of radio or radar antenna, similar to the shape of a soup bowl.

DISLOCATION MOTION
The slip of adjacent rows of molecules in an imperfect crystalline structure which has a profound effect on the properties of the material.

DISPLACEMENT
In vibratory motion, the instantaneous distance of the object from the zero or rest position. The single amplitude displacement is the maximum distance the object travels from the zero position. The double amplitude displacement is the maximum total distance the object travels both sides of the zero position.

DISPLAY
The visual or graphic presentation of the output data of any device or system.
See—Apollo Guidance Ground Display
coupling display unit

DISPLAY AND CONTROL (SUBSYSTEM) D&C
A console in which all display and control devices of the various subsystems are mounted. It will include a map and visual display unit, computer devices, etc.

DISTRIBUTION
See—cumulative distribution function
frequency distribution function
gaussian distribution
normal distribution function

DISTRIBUTION FUNCTION OF LIFETIMES
The probability that a new product will fail by time T. The distribution function of lifetimes therefore represents that fraction of the original population expected to fail by time T.

DOCKING
The technique of closing and locking together two or more spacecraft in orbit. The final stage of the rendezvous operation.

DOCUMENTATION
Information that is generated to record data required for control of design, production, procurement, maintenance, and supply of material, e.g., drawings, specifications, handbooks, manuals, etc.
See—Type I Documentation
Type II Documentation
Type III Documentation

DOCUMENTED STAGE
A portion of a launch vehicle as described in the technical requirements of the stage contractor's contract.

DOD
Department of Defense.

DOGHOUSE
A protuberance or blister that houses an instrument on an otherwise smooth skin of a rocket or space vehicle.

DOLLY
A small wheeled truck or platform which can be used to move pieces of equipment or assemblies.

DOPPLER EFFECT
The apparent change in frequency of a sound or radio wave, reaching an observer or a radio receiver, during a change in distance or range between the source, the observer, or the receiver. The magnitude of the frequency shift is proportional to the relative velocity of the source with respect to the receiver.

DOPPLER RADAR
Radar that measures the velocity of a moving object by measuring the shift in carrier frequency of the return signal. The shift is proportional to the velocity with which the object approaches or recedes from the radar station.

DOPPLER SHIFT
The change in frequency with which energy reaches a receiver when the source of radiation or a reflector of the

radiation and the receiver are in motion relative to each other. The doppler shift is used in many tracking and navigation systems.

DOPPLER VELOCITY AND POSITION **DOVAP**
A tracking system wherein radio signals, sent by a ground station to a receiver in a spacecraft, are returned to the earth on a different frequency.

DOSIMETER
A device, generally worn by persons working near radioactive material, which indicates the amount (dose) of radiation exposure.

DOSIMETRY
The measurement of small quantities or doses of radiation.

DOUBLE SAMPLING
Sampling inspection in which the inspection of the first sample leads to a decision to accept, to reject, or to take a second sample. The examination of a second sample when required, always leads to a decision to accept or to reject.

DOVAP
Doppler Velocity and Position.

DOWN TIME
The total time during which the system is not in condition to perform its intended function. Down time can in turn be subdivided into repair time, logistic time and administrative time.

See—supply downtime
total mean downtime

DOWNRANGE
A direction away from the launch site toward the impact or target area. Missile test range.

DRAG
Aerodynamic force in a direction opposite to that of flight and due to the resistance of the body to motion in air.

See—lift drag ratio

DRAWING **DRWG**
Representation of components or system.

See—arrangement drawing
assembly drawing
class I drawing
component drawing
construction drawing
detail drawing
diagram drawing
engineering drawing
envelope drawing
erection drawing
form drawing
installation drawing
interface drawing
kit drawing
matched parts drawing
modified drawing
official drawing
plan drawing
process drawing
production drawing
roll size drawing
sketch drawing
source control drawing
tabulated drawing
undimensioned drawing
word description drawing

DRIFT
See—gyro drift

DROGUE PARACHUTE
A type of parachute attached to a body, used to slow it down. Also called deceleration parachute, or drag parachute.

DRY CONDITION
A condition of a stage or module such that no fluids (liquid or gaseous) other than those used for purging, drying, or storage are contained within the module or stage.

DRY RUN
A practice exercise or rehearsal especially observed in preparation for equipment operation or rocket launching.

DRY WEIGHT
The weight of a vehicle without its fuel, or propellants, or other fluids.

DSGN
Design.

DSIF
Deep Space Instrumentation Facility.

DUAL THRUST
Thrust derived from two propellant grains using the same propulsion section of a missile or space vehicle.

DUPLEXER
A device which permits a single antenna system to be used for both transmitting and receiving.

DUST BED REACTOR
A nuclear reactor with the fuel in the form of a finely divided powder rather than coventional solid structure.

DRWG
Drawing.

DYNAMIC BEHAVIOR
The behavior of a system or component under actual operation conditions e. g., acceleration, vibration.

DYNAMIC CONVERSION
The conversion of energy from one form to another through the use of a moving device. e. g., a reciprocating engine or turbo-alternator.

DYNAMIC ENVIRONMENTS
Environments consisting of dynamic forces such as those due to vibrations, shock, and accelerations.

DYNAMIC LOAD
A load associated with the elastic deformations of a structure subjected to time-dependent external forces.

DYNAMIC LOCK-UP
Results from a simulated flow stoppage under operational conditions using a solenoid actuated valve.

DYNAMIC PRESSURE
Symbol (Q)
(1) The pressure exerted by a fluid, such as air, by virtue of its motion.
(2) The pressure exerted on a body, by virtue of its motion through a fluid. E.g., the pressure exerted on a rocket moving through the atmosphere.

DYNAMIC RESPONSE
The time varying motion of a given structure to a given force input. For instance, for a space vehicle that is exposed to side acting winds during flight, the dynamic response would consist of a rigid body rotation of the vehicle plus a bending deformation, both varying with time.

DYNAMIC STABILITY
The property of a body (a rocket or airplane) that, when disturbed from an original state of steay flight or motion, dampens the oscillations set up by the restoring movements, gradually returning the body to its original state.

DYNAMIC TEST STAGE
Flight-type, non-propulsive stage for use in composite Saturn vehicle dynamic testing. Capable of being filled with a fuel substitute, pressurized, and drained, with weight and center of gravity the same as for flight. Non-gimballing masses simulate engines.

DYSBARISM
A general term which includes a complex variety of symptoms within the body caused by changes in ambient barometric pressure, exclusive of hypoxia. Characteristic symptoms are bends and abdominal gas pains at altitudes above 25,000 to 30,000 feet. Also at increased barometric pressure, as in descent from high altitude, the symptoms are characterized by painful distention of the ear drums and sinuses.

E

E MAD
Engine Maintenance Assembly and Disassembly Building.

EAFB
Edwards Air Force Base.

EAM
Electric accounting machine.

EARLY FAILURE PERIOD
The period of equipment life starting just after final assembly where equipment failures occur initially at a higher than normal rate due to the presence of defective parts and abnormal operating procedures. Also called "Debugging" or "Burn-in" period.

EARTH FIXED REFERENCE
An oriented system using some earth phenomena for positioning.

EARTH LANDING SYSTEM **ELS**
A parachute deployment system in the command module (CM) for returning the flight crew safely to Earth following reentry. It provides post-entry stabilization, velocity control, and impact attenuation.

EARTH ORBIT RENDEZVOUS **EOR**
A mode involving rendezvous and coupling, fueling, or transfer in an earth parking orbit to accomplish a mission.

EARTH-STABILIZED SATELLITES
Satellites whose axes maintain a constant relationship to the center of the Earth, although not to a fixed spot on the surface of the Earth.

EARTH'S HEAT BUDGET
The integrated consideration of gains and losses in the Earth's radiation. The major gains deriving from solar radiation. The major losses being those from emitting radiation.

EBULLISM
The formation of bubbles, with particular reference to water vapor bubbles in biological fluids, caused by reduced ambient pressure.

EBW
Exploding Bridge Wire.

ECCENTRIC
Not having the same center. Varying from a circle, as in eccentric orbit.

ECCENTRIC ORBIT
A highly eliptical orbit having a very high apogee and low perigee.

ECCENTRICITY
The degree of deviation from a circular orbit.

ECHO
Passive reflecting inflatable satellite.

ECLIPSE
See—annular eclipse

ECLIPTIC
Plane of the earth's orbit around the sun. Used as a reference plane for other interplanetary orbits.

ECLIPTIC PLANE
The plane of the earth's motion about the sun.

ECOLOGICAL SYSTEM
A habitable environment, either created artificially such as in a manned space vehicle or occurring naturally such as the environment on the surface of the earth in which man, animals, or other organisms can live in mutual relationship with each other.
See—closed ecological system

ECOSPHERE
Spherical extent inhabited by living organisms or suitable for life of such organisms. Also, layer of space about the sun extending from and including Venus through Mars.

ECP
Engineering change proposal.

ECS
Environmental Control System.

EDP CENTER
Electronic data-processing center.

EDPC
Electronic data processing center.

EFFECTIVE ATMOSPHERE
That part of the atmosphere which effectively influences a particular process of motion, such as aerodynamic support, or air friction.

EFFECTIVE EXHAUST VELOCITY
The velocity of an exhaust stream after being reduced by the effects of friction, heat transfer, nonaxially directed flow, and other conditions.

EGADS BUTTON
A button used by the range safety officer to destruct a missile in flight. The word EGADS is an acronym for Electronic Ground Automatic Destruct Sequencer.

EGO
Eccentric Geophysical Observatory (part of OGO)

EGRESS
The act of or the mechanism for exit from an enclosure. In spacecraft this can relate to the act of a crew member exiting from the vehicle or it can describe the exit chamber, pressure lock and hatchways.

EJECTION CAPSULE
(1) In an aircraft or manned spacecraft, a detachable compartment serving as a cockpit or cabin, which may be ejected as a unit and parachuted to the ground.
(2) In an artificial satellite, probe, or unmanned spacecraft, a boxlike unit usually containing recording instruments or records of observed data, which may be ejected and returned to Earth by a parachute or other deceleration device.

EKG
Electrocardiograph.

ELASTICIZER
An elastic substance or fuel used in a solid rocket propellant to prevent cracking of the propellant grain and to bind it to the combustion chamber case.

ELECTRIC ENGINE
Projected ion or plasma engine, so named because of the separation of charged particles.

ELECTRICAL POWER SYSTEM
There are two independent electrical power systems in the Apollo spacecraft. The one which supplies power to the command module (CM) has major components located in both the command module and the service module (SM). The other supplies, regulates, and distributes all electrical power required by the lunar excursion module (LEM). Major power sources are fuel cells and batteries.

ELECTRIC PROPULSION
The generation of thrust for a rocket engine involving acceleration of a propellant by some electrical device such as an arc jet, ion engine, or magnetohydrodynamic accelerator.

ELECTRO-CHEMICAL CELL
Genetic term for chemical battery. Device for producing electricity by chemical reaction.

ELECTROCARDIOGRAPH **EKG**
An instrument which measures and records the electric current or voltage wave forms associated with the action of the heart muscles. The record produced is called an electrocardiogram or cardiogram.

ELECTRODE EROSION
The gradual destruction of the component of an electric arc from which the arc emanates by a combination of heat, chemical reaction, and physical shock.

ELECTROENCEPHALOGRAM
The measurement and recording of brain voltages or waves. The instrument used for this purpose is called an electroencephalograph.

ELECTROJET
A concentrated stream of electricity of limited width. One such stream flows westward on the morning side of the Earth, and a weaker one flows eastward on the evening side.

ELECTROMAGNETIC RADIATION
Energy propagated through space or through material media in the form of an advancing disturbance in electrical and magnetic fields existing in space or in the media. Also called simply radiation.

ELECTROMAGNETIC SPECTRUM
A collective term for all known radiation from the shortest-waved gamma rays thru x-rays, ultraviolet, visible light, infrared waves, to radio waves.

ELECTROMAGNETIC WAVE
Form in which radiant energy travels, produced by oscillation of an electric charge, and including waves of radio, infrared, visible light, ultra-violet light, x-rays, gamma rays, and cosmic rays when considered as quanta of energy.

ELECTRON
The subatomic particle that possesses the smallest possible electric charge.

ELECTRONIC DATA PROCESSING
The use of electronic devices and systems in the processing of data so as to interpret the data and put it into usable form.

ELECTRONIC DATA PROCESSING CENTER **EDPC**
A center that maintains automatic equipment, including computers, designed to simplify the use and interpretation of the mass of data gathered by modern instrumentation installations or information collection agencies.

ELECTRONIC GROUND AUTOMATIC DESTRUCT SEQUENCER **EGADS**
A destruct system control used by the range safety officer to destroy a missile in flight.

ELECTRONIC NOISE INTERFERENCE
Any electrical disturbance generated in an equipment, which may produce an undesirable indication, response, or malfunction in some other equipment. This is exclusive of interference which may be caused by a transmitter radiating its proper fundamental signal.

ELECTROSTATIC
Electricity at rest. Stationary electrical particles.

ELECTROSTATIC CHARGE
The difference in electric potential of a material and its surroundings in the condition when there is no flow of electrical current between this material and its surroundings.

ELECTROSTATIC GYRO
A gyro supported by an electrostatic field.

ELS
Earth landing system.

EMISSIVE POWER
See—monochromatic emmissive power
total emissive power

EMISSIVITY
The term for the relative power of a surface or a material, composing a surface, to emit heat by radiation.

EMITTANCE
See—hemispherical emittance
monochromatic emittance
total emittance

EMPIRE
Early Manned Planetary Interruptionless Round-trip Expedition.

EMPTY WEIGHT
The design gross weight less the design useful load.

END ITEM
A combination of parts, assemblies, accessories, or attachments, which are integrated to form an equipment that accomplishes a specific function when put to use. An end item is complete within itself and classified as such for purposes of separate manufacture, procurement, drawings, specifications, storage, issue, maintenence, or use.

END PRODUCT
A term used to denote the product being offered for sale by manufacturing concerns. It is synonomous with end item.

END USE
The purpose for which the ultimate consumer employs a device.

ENERGETIC PARTICLE
An electron, positron, neutron, or other elementary particle of matter traveling at extremely high speeds. Such particles originate in outer space or from the Sun and lose their energy in the atmosphere.

ENGINE
See—booster engine
electric engine
F-1 engine
H-1 engine
ion engine
liquid-air cycle engine
lunar retrograde engine
M-1 engine
oxygen-hydrocarbon engine
photon engine
plasma engine
reaction engine
rocket engine
sustainer engine
vernier engine

ENGINE MAINTENANCE ASSEMBLY AND DISASSEMBLY (BUILDING) E MAD
A facility at the nuclear rocket development station (NRDS) for the nerva engine.

ENGINE SLING
A piece of equipment consisting of a spreader bar provided with a hoist eye and lifting legs for attachment to the engine.

ENGINE SURGE
Uneven performance of an engine.

ENGINE-STAGE INTEGRATION
The uniting of the engine and vehicle stage to determine interface problems.

ENGINEERING
See—human engineering
quality engineering
systems engineering

ENGINEERING CONFIDENCE
Confidence, in a design or product, which is based on engineering calculations and tests.

ENGINEERING DATA
Engineering drawings, supporting specifications, indexes, and related engineering documents.

ENGINEERING DRAWING
Dimensionally verifiable engineering delineations setting forth pictorial or descriptive language representations, or combinations thereof. They present the complete engineering requirements for fabrication inspection, evaluation, and identification of all details, assemblies, and units of the finished product.

ENGINEERING MODEL
First development model of the complete technical system used to demonstrate the technical principles of operation. It is the first approach to a system including tactical, logistical, and technical considerations.

ENGINEERING TEST
A test conducted by, or under supervision of, the technical service concerned, with a scientific approach where the objective of the test is to determine inherent structural, electrical, or other physical and chemical qualities of the item or system tested, including those of an environmental nature.
See—development engineering test
final engineering test

ENVELOPE DRAWING
An envelope drawing shows outline, overall and mounting dimensions, and other dimensions and data necessary to

disclose mechanical, electrical, functional and physical interchangeability of items regardless of the detail design.

ENVIRONMENT
The aggregate of all the conditions and influences which affect the operation of equipments and components.
See—artifical environment
induced environment
immediate environment
natural environment
physical environment

ENVIRONMENTAL CONTROL SYSTEM **ECS**
This system, with components located in all three spacecraft modules but primarily in the command module (CM), maintains cabin environment in the command module and the lunar excursion module (LEM), provides a conditioned atmosphere for pressure suit operation, provides thermal control of equipment in all three modules, and is used for recharging the portable life support subsystems.

ENVIRONMENTAL CONTROL SYSTEM RADIATOR
A heat exchanger used in the environmental control system to dissipate, in space, heat from the environmental control system in the spacecraft.

ENVIRONMENTAL RANGE
The range of environment throughout which a system or portion thereof is capable of operation at the specified level of reliability.
See—acceptable enviromental range test

ENVIRONMENTAL SPACE CHAMBER
A chamber (sometimes a simulated spacecraft) in which humidity, temperature, pressure, fluid contents, noise and movement may be controlled so as to simulate different space conditions. It is normally used for astronaut training.

ENVIRONMENTAL TEST AND SERVICE BUILDING
A facility that provides the equipment checking and testing of environmental systems and components installed in the spacecraft.

ENVIRONMENTAL TOLERANCE
The ability of a system, or portion thereof, to operate within a specified range.

EOR
Earth Orbit Rendezvous.

EPHEMERIS
Book of tables giving daily positions of celestial bodies.

EQUATORIAL ORBIT
An orbit in the plane of the Earth's equator.

EQUI-PERIOD TRANSFER ORBIT
Elliptical lunar orbit utilized by the lunar excursion module to approach within approximately 50,000 feet of the lunar surface while maintaining the same orbital period as that of the command module and service module.

EQUIP
Equipment.

EQUIPMENT **EQUIP**
One or more assemblies, or a combination of items, capable of independently performing a complete function.
See—auxiliary equipment
checkout equipment
complete operating equipment
contractor furnished equipment
government furnished equipment
ground servicing equipment
ground support equipment
IMU ground support equipment
inertial component test equipment
mass properties determination equipment
operational ground equipment
stage calibration equipment

EQUIPMENT FAILURE
When an equipment no longer meets the minimum acceptable specified performance and cannot be restored through operator adjustment of controls.

EQUIPMENT LONGEVITY
The length of the normal operating period of equipment life specified either in terms of equipment hours or operations per calendar time.

EQUIPMENT RELIABILITY
The probability of performing a specified function, under given conditions, at a measured reliability index (average failure rate in terms of its reciprocal mean-time-between-failures) and for measured equipment longevity (the total period of time during which this quality is maintained).

ERECTION DRAWING
Shows procedure and operation sequence for erection or assembly of individual items or assemblies of items.

ESCAPE
A sufficient velocity outward from a primary body so as neither to fall back to the body nor to orbit it.

ESCAPE TOWER
A tower, mounted atop the command module, containing a cluster of small rockets to jettison the spacecraft from the booster in the event of a mission abort.

ESCAPE TRAJECTORY
That path a body must follow to escape a central force field.

ESCAPE VELOCITY
The velocity which is required by an object to overcome the gravitational pull of the earth or other astronomical body to move into space. The escape velocity from earth's gravity field is approximately seven miles per second.

ESSENTIAL REPAIR
Only those repairs necessary to ensure that an end item is restored to a serviceable condition and will efficiently accomplish its intended purpose.

EXHAUST NOZZLE
That portion of the thrust chamber which lies on the downstream side at the nozzle throat.

EXHAUST STREAM
The stream of gaseous, atomic or radiant particles, that emit from the nozzle of a reaction engine.

EXHAUST SYSTEM
A part of an air vehicle's power plant installation. It includes all manifolds or stacks used for collecting and conducting exhaust gases to points of discharge, for utilizing exhaust heat, or cooling exhaust gases, for effecting flame damping. and for silencing exhaust noise.

EXHAUST VELOCITY
The velocity of exhaust gases through the nozzle of a rocket engine or motor.
See—effective exhaust velocity

EXOBIOLOGY
The study of living organisms existing on celestial bodies other than the Earth.

EXOSPHERE
The outermost fringe or layer of the atmosphere where collisions between molecular particles are so rare that only the force of gravity will return escaping molecules to the upper atmosphere.

EXOTIC FUEL
Any fuel considered to be unusual, as a boron-based fuel.

EXPANSION LOOP
A device included in the transfer line of the RP-1 fuel system complex which compensates for expansion and contraction due to changes in temperature.

EXPERIMENT
See—critical flight experiment
piggy back experiment

EXPERIMENTAL MODEL
A model of the complete equipment to demonstrate the technical soundness of the basic idea.

EXPERIMENTS
See—critical flight experiments

EXPLODING BRIDGE WIRE **EBW**
A metal or metal alloy wire which is violently disintegrated by the compression of a large pulse of electrical energy, producing a shock wave, temperatures up to 10^6 degrees kelvin, and electromagnetic radiation, infrared through X-rays. Such equipment in conjunction with ordnance is commonly used in systems for initiating stage retrorocket, separation and destruct systems.

EXPLODING BRIDGE WIRE SYSTEMS
Equipment and ordnance capable of initiating stage retrorocket, separation and destruct system ordnance equipment.

EXPLORER SATELLITE SERIES
A series of small scientific satellites (up to 300 pounds) launched into near-earth orbits to investigate space phenomena.

EXPLOSIVE BOLT
A bolt incorporating an explosive which is detonated on command, thus destroying the bolt and releasing the mated unit. Used to separate one stage from another.

EXPLOSIVE-DEVICES SIMULATOR SET
Auxiliary equipment facilitating GSE combined systems checkout of the spacecraft and launch devices. The simulator measures the magnitude of the firing impulse to determine whether the explosive device would have fired, and verifies that no undesired impulses are present to cause accidental firing.

EXPOSED TEST POINT
A test point which is readily accessible when the equipment is in normal operating condition and position.

EXTERIOR BALLISTICS
A branch of ballistics concerned with the behavior of a missile during flight, influenced by conditions of air density, temperatures, velocity etc.

EXTRAGALACTIC NEBULAE
Star systems outside our own galaxy.

EXTRATERRESTRIAL
From outside the Earth.

EXTRAVEHICULAR
Outside the vehicle.

EYEBALLS DOWN
Positive g. The acceleration stress that the subject experiences as acting from above.

EYEBALLS IN
Supine g. The acceleration stress experienced in the chest-to-back direction.

EYEBALLS OUT
Prone g. The acceleration stress experienced in the back-to-chest direction.

EYEBALLS UP
Negative g. The acceleration stress that the subject experiences as acting from below.

F

F-1 ENGINE
A liquid-propellant rocket engine designed to develop 1-1/2 million pounds of thrust at sea level. The F-1 uses liquid oxygen (LOX) and kerosene-base fuel (RP-1) as propellants, and will be used in the first stage of the Saturn V and Nova launch vehicles. Cognizant center Marshall Space Flight Center.

FABRICATION TOLERANCE
The maximum variation in the characteristics of a component which, when related to the defined variations of the other components comprising this equipment, will permit operation of the equipment within specified limits.

FABU
Fuel Additive Blender Unit.

FACILITIES
A physical plant or installation to permit the performance of a function (buildings, shelters, roads, utilities, shops, etc.).
See–test facilities

FACILITY
See–pyrotechnic test and weight and balance facility
reaction control facility
spacecraft operations and checkout facility

FACTOR
See–confidence factor
degradation factor
human factors
importance factor or criticality factor
load factor
physiological factors
safety factor
yield strength load factor

FACTOR OF SAFETY
The ratio of the criterion load or stress to the limit load or stress.

FACTORIAL DESIGN
In experimental design, the selection for testing of combinations of values of all independent variables, or factors, which are characteristic of the entire allowable variable ranges.

FAE
Final Approach Equipment.

FAIL-SAFE DESIGN
Design considerations to prevent probable equipment failures or malfunctions which may injure the operator or the equipment itself.

FAILURE
The inability of a system, subsystem, component, or part to perform its required function.
See–catastrophic failure
chance failure
critical failure
degradation failure
early failure period
equipment failure
fatal failure
independent failures
initial failure
mean cycles to failure
meantime between failures
mean time to failure
mean time to first failure
part failure
random failure
secondary failure
system chance failures
test to failure
wearout failures

FAILURE MECHANISM
The physical process which results in a part or equipment failure.
See–failure mode

FAILURE MODE
The physical description of the manner in which a failure occurs, and the operating condition of the equipment at the time of the failure.
See–failure mechanism

FAILURE MODE ANALYSIS
An extensive program to isolate all known failure modes and to identify these failure modes with the appropriate materials, production processes, production controls, and environments or design.

FAILURE MODE AND EFFECT ANALYSIS
An analysis of possible modes of failure, their cause, effects, expected frequency of occurrence and means of elimination.

FAILURE RATE
Rate at which failures occur as a function of time. If the failure rate is constant, it is frequently expressed as the reciprocal of mean time between failure (MTBF).
See–equipment failure rate
part failure rate
system failure rate

FAILURE REPORTING AND CORRECTIVE ACTION
A systematic and comprehensive method of reporting all failures and a plan for implementing corrective action as a result of these failures.

FALLAWAY SECTION
A section of a rocket vehicle that separates from the vehicle during flight, especially such a section that falls back to Earth.

FAMU
Fuel Additive Mixture Unit.

FATAL FAILURE
A failure which results in the loss of human life.

FATIGUE
A weakening or deterioration of metal or other material, or of a member occurring under load, especially under repeated, cyclic, or continued loading.

FATIGUE LOADS
Loads applied to a structure which by their repetitive nature produce a fatigue failure of the structure.

FAULT
An attribute which adversely affects the reliability of a device.

FEASIBILITY STUDY
The phase during which studies are made of a proposed item or technique to determine the degree to which it is practicable, advisable, and adaptable for the intended purpose.

FEATURE
Distinctive characteristic of one or more surfaces of a part such as a rabbet, hole, screw thread, etc.

FEED HORN
A device that radiates or collects energy from a parabolic antenna.

FEED-BACK INSTRUMENTS
Instruments in which part of the output signal is fed back as input at proper phases to amplify or decrease strength of the signal.

FIELD
A region of space at each point of which a given physical quantity has some definite value, thus a gravitational field, electric field, magnetic field, etc.
See—data field
depth of field
flow fields
geomagnetic field

FIELD CHANGE ORDER
Instructions issued by field service division to field personnel for making desired changes to items of equipment in field use.

FIELD MAINTENANCE
Maintenance authorized and performed by designated maintenance activities in direct support of a using organization.

FILM COOLING
The cooling of a body or surface, such as the inner surface of a rocket combustion chamber, by maintaining a thin fluid layer over the affected area.

FILTER/SEPARATOR
A device designed to remove foreign material and condensation from fluids such as RP-1 fuel.

FINAL APPROACH EQUIPMENT (SUBSYSTEM) FAE
This subsystem involves the combined usage of the Apollo guidance and navigation equipment subsystems, radar, radio altimeter etc., required in effecting a safe approach and landing on the Moon or upon return to Earth.

FINAL CALIBRATION CURVE
Output characteristics of a measuring device or component obtained from a calibration test.

FINAL ENGINEERING TEST
The phase which provides the final ordnance corps independent evaluation of a system, major combination, or end item. It includes the issuance of the test directive by the assistant chief of ordnance, the submission of a test plan by the test agency, the procurement of items to be tested, the conduct of the test in conformance with the plan, and concludes with the evaluation of the test results.

FINAL MEASUREMENT
The last actural measurement of mass properties made by a contractor prior to delivery to the procuring activity.

FINAL TRIM
The final adjustment of a ballistic missile to insure exact direction as programmed for its flight (normally accomplished by vernier engines).

FINISH
Any surface treatment to protect equipment or enhance appearances.

FINS
See—stub fins

FIRE
Flight investigation reentry environment.

FIRING (TYPES OF)
See—flight readiness firings
full duration static test firing
static firing

FIRING CHAMBER
Chamber in a rocket engine in which the fuel and oxidizer are ignited, and in which pressures of gases are built up to provide an exhaust velocity sufficient to attain thrust.

FIRING ROOM
A room in the launch control center of complex 39 which will contain the necessary electrical panels to monitor and initiate the operation of each facility operation and controlled from the pad terminal connection room.

FIRST MOTION
First indication of motion of a missile from its launcher. Synonymous with takeoff for vertically launched missiles.

FISSION
The release of nuclear energy through splitting of atoms.

FISSION FRAGMENT CONVERTER
A device that utilizes charged fission fragments from fission plates to produce electrical power.

FISSION FRAGMENT PHYSICS
The study of the behavior of the high energy particles resulting from a nuclear fission reaction.

FISSURING
An undesired cracking or splitting of solid propellants. Results in increased burning areas and increased rate of gas evolution.

FIT
General term used to signify the range of tightness which may result from the application of a specific combination of allowances and tolerances in the design of mating parts.
See—actual fit
clearance fit
interference fit
transition fit

FIXED SATELLITE
An Earth satellite that orbits from west to east at such a speed as to remain constantly over a given place on the Earth's equator.

FLAME BUCKET
Opening built into launch pads to collect hot gases during rocket thrust buildup.

FLAME-RESISTANT MATERIAL
A material which will not support combustion.

FLAMMABLE
Capable of being easily ignited, preferred to the older equivalent inflammable.

FLARE (SUN)
A bright eruption from the Sun's chromosphere.
See—solar flare

FLASHBACK
A reversal of flame propagation in a system (counter to the usual flow of the combustible mixture).

FLASHLIGHT
Geodetic triangulation survey technique using space flares.

FLEXIBILITY
Design features to permit rapid change from primary to secondary capability.

FLIGHT
The phase of operations beginning with lift-off and ending when the command module lands upon the earth.
See—coasting flight
direct flight

FLIGHT ACCEPTANCE TEST
A test conducted to prove that the actual operational hardware intended for flight use has been fabricated in accordance with specifications. Tests are conducted under conditions expected to be encountered in actual operations.

FLIGHT CREW
The Apollo flight crew consists of three men who are cross trained to be capable of manning any of the command module (CM) duty stations. The three crewmen are designated commander, navigator, and systems manager. The CM commander is also the lunar excursion module (LEM) commander.

FLIGHT MISSION
Within a project, the specific technical or scientific objective to be accomplished by a given launching of a space vehicle or launch vehicle.

FLIGHT PROFILE
A graphic portrayal or plot of a vehicle's flight path in the vertical plane.

FLIGHT READINESS FIRINGS **FRF**
Missile system tests, of short duration, conducted with the propulsion system operating while the missile is secured to the launcher.

FLIGHT RELIABILITY
The probability that a flight will be successfully completed based on successful completion of countdown.

FLIGHT RESEARCH CENTER (NASA) **FRC**
A unique and highly specialized facility, emphasizing research on manned flight in extreme-performance aircraft and spacecraft. It is located at Edwards, Calif., adjacent to Edwards Air Force Base.

FLIGHT SEQUENCER
A component that receives voltages from the programmer or GSE and in turn supplies an output voltage to other components in the vehicle system.

FLIGHT SIMULATOR
Synthetic flight trainer capable of simulating a complete flight of a specified space vehicle.

FLIGHT STAGE
The complete space vehicle at any given point in the flight trajectory.

FLIGHT TEST
Tests involving rocket powered flight in an upward trajectory from the Earth's surface. May include sub-orbital, orbital, or translunar flights.
See—simulated flight test

FLIGHT TESTING
Program of complete vehicle launches (including combinations of nonpropulsive and live stages) utilizing the full capability of the range to provide space position information and to record and store the telemetry signals.

FLOW
See—hypersonic flow
laminar flow
weight flow rate

FLOW FIELDS
The total condition of a fluid or gas flowing around a body including speed, pressure, density, and heat.

FLUID BED REACTOR
A nuclear reactor with fuel in a fluid state.

FLUTTER
The unstable self-excited oscillation of an airfoil and its associated structure in flight, caused by a combination of the aerodynamic, inertial, and elastic characteristics of the components themselves, and not by an externally applied vibratory excitations.
See—coupled servo flutter

FLY-AWAY DISCONNECTS
Umbilical connections or other connections to the stages of the space vehicle which disconnect from the space vehicle at lift-off, either mechanically or by the actual rising of the vehicle off the launch pad.

FLY-WHEEL TYPE RESONANCE
Resonance between a once-per-revolution forcing function, either mechanical or aerodynamic, and a natural mode of rotor vibration in the direction of the rotor plane.

FM/CW
Frequency Modulated Continuous Wave.

FORCE
See—brute force method
centrifugal force
centripetal force
coriolis force
inertial force
pound force

FORCE-BREAK MACH NUMBER
Speed at which a radical change occurs in the aerodynamic characteristics of an aircraft resulting in increasing values of the drag coefficient.

FORM DIMENSION
One which cannot be properly defined by dimensions of size or location. The angle of the frustrum of a cone, the involute of a gear tooth, the angle of a thread, etc.

FORM DRAWING
Contains established information pertinent to an item, part, or component preprinted on a drawing form.

FORMATION OF LOTS
Each lot shall, as far as is practicable, consist of units of product of a single type, grade, class, size, or composition manufactured under essentially the same conditions.

FP
Freezing Point.

FPS
Feet Per Second.

FRANGIBLE TUBE LOAD ALLEVIATOR
System which consists of tubes attached to the landing vehicle and to a die attached to a landing skid or foot. The tube presses over the die during impact and fails in fragments.

FRC
Flight Research Center.

FREE FALL
The motion of any unpowered body in a gravitational field.

FREE-FLIGHT TRAJECTORY
A ballistic missile's trajectory that begins with thrust cut-off and ends at reentry.

FREEZE-OUT METHOD
A method for controlling the composition of gases or liquids by freezing and separating frozen matter from the remaining liquids or fluids.

FREQUENCY DISTRIBUTION FUNCTION
The derivation of the cumulative distribution function.
See—cumulative distribution function

FREQUENCY MODULATED CONTINUOUS WAVE **FM/CW**
A radio or radar signal whose frequency is continuously varied.

FRF
Flight Readiness Firings.

FROST
Food Reserves On Space Trips.
See—ice frost

FUEL
See—chemical fuel
cyrogenic fuel
exotic fuel
hydrocarbon fuel
hypergolic fuel
nuclear fuel
RP-1 fuel system complex

FUEL CELL
A continuously fed battery which converts chemical energy directly into electrical energy by mixing a fuel and an oxidizer in a cell. Because it is continuously fed, it produces electricity over a longer period of time than a storage battery.

FUEL PAD
An area which contains all the equipment necessary to store, filter and transfer fuel from the fuel pad storage tanks through transfer lines to the space vehicle fuel tanks. The fuel pad is considered part of a fuel system complex.

FULL DURATION STATIC TEST FIRING
The testing of a vehicle component, engine or stage, in a stationary or hold-down position for its full rated time.

FUNCTIONAL ANALYSIS (FOR MAINTAINABILITY)
The investigation of alternative man and machine capabilities which may be used to satisfy established system requirements. The analytical basis for allocating activities to personnel and equipment so as to achieve optimum system performance.

FUNCTIONAL RELIABILITY
The probability that a system will successfully complete the final checkout preparatory to launching, given that it was ready at demand.

FUNCTIONAL SURFACE
The surface of a part or an assembly which controls the positioning of the parts in the assembly.

FUNCTIONAL TEST
A test performed to demonstrate that the item operates as specified (required).

FUNCTIONING ITEM
Any assembly, component, or part which affects the operation of the end article and which is replaceable in the field by organizational, field, or depot teams.

FUNGAL SPORE
A reproductive form of a fungus which can survive environmental extremes.

FUSION
The release of nuclear energy through uniting of atoms.

FUSION ROCKET
A conceptual nuclear rocket utilizing the nuclear fusion process for the energy sources, as distinguished from the fission process.

FUSION WELD
A weld made by melting material, usually a filler material, by electric arc or gas flame. Pressure is not used and base metal is melted in the process.

FY
Fiscal Year.

G

G OR G-FORCE
The measure or value of the gravitational pull of the earth as modified by the earth's rotation, equal to the acceleration of a freely moving body at the rate of 32.16 feet per second.
See—negative g
positive g
supine g

G&N
Guidance And Navigation.

G-SUIT
A device that exerts pressure on the abdomen and lower parts of the body to prevent or retard the collection of blood below the chest, under positive acceleration.

G-TOLERANCE
The tolerance in c person, animal or equipment to an acceleration of a particular value.

GAGE DIMENSION
The term gage is applied to a working dimension with a zero tolerance.

GALACTIC ASTRONOMY
The study of the galaxies and their components.

GALACTIC COSMIC RAYS
Cosmic rays that do not originate in the sun are referred to as galactic cosmic rays and are those of the greatest energy.

GAMMA RADIATION
Electromagnetic radiation, similar to x-rays, originating from the nucleus of an atom and having a high degree of penetration.

GAMMA RAY
An electromagnetic radiation or wave form emitted by a radioactive nucleus and similar to x-rays but of higher energy and shorter wavelength.

GANTRY
A crane-type structure, with platforms on different levels, used to erect, assemble, and service large rockets or missiles.

GARBAGE (COLLOQUIAL)
Miscellaneous objects in orbit, usually material ejected or broken away from a launch vehicle or satellite.

GAS CAP
See—incandescent gas cap

GAS CONVERTER BUILDING
A building or facility which contains equipment necessary to pressurize and vaporize liquid fluids such as nitrogen and helium.

GAS GENERATOR
A combustion chamber used to provide hot gases for a turbine or motor to drive the propellant pumps of a rocket engine, or to provide a source of gas at some predetermined pressure program. Gas generators are usually operated fuel-rich to maintain the container temperature at reduced values.

GAS STORAGE BATTERY
A system of high pressure gas storage cylinders, including a manifold of associated valves, regulators and pipings capable of storing high-pressure gaseous nitrogen and helium (part of the high-pressure gas storage facility).

GAS VORTEX SYSTEM
A cavity reactor in which the nuclear fuel is separated from the propellant by centrifugal force.

GASEOUS CORE REACTOR
A nuclear reactor with fuel in a gaseous rather than solid state.

GCTS
Ground Communications Tracking Systems.

GEGENSCHEIN
Faint light area of the sky always opposite the position of the Sun on the celestial sphere. Believed to be the reflection of sunlight from particles moving beyond the Earth's orbit.

GEMINI
A project to develop space rendezvous and docking techniques in orbit, using a two-man capsule.

GENERATION
Technical or technological development stage or period that is marked by features of performance nonexistent in a previous period of development or production.

GENERATION BREAKDOWN
An outline of a missile or a missile system, listing major combinations, major items, principal items and secondary items in descending order, including drawing numbers.

GENERATOR
See—thrust generator

GEO
A prefix meaning Earth.

GEOCENTRIC
Relating to or measured from the Earth's center.

GEODESY
Science which treats the shape and size of the Earth through applied mathematics.

GEODETIC
Pertaining to or determined by geodesy.

GEOHYDROMAGNETICS
The study of the upper atmosphere and radiation belts that surround the Earth, and their interactions with charged particles streaming from the Sun's and the Earth's magnetic field.

GEOMAGNETIC FIELD
The magnetic field of force surrounding the Earth.

GEOMAGNETISM
The magnetic phenomena, collectively considered, exhibited by the Earth and its atmosphere. The magnetic phenomena in interplanetary space.

GEOPHYSICS
The physics of Earth and its environment.

GEOPOTENTIAL
The potential energy of a unit mass relative to sea level, numerically equal to the work that would be done in lifting the unit mass from sea level to the height at which the mass is located. Commonly expressed in terms of dynamic height or geopotential height.

GEOPROBE
A non recoverable scientific probe to obtain vertical profiles of the atmospheric and ionospheric structures and composition.

GEOSTATIONARY ORBIT
The path of a satellite that completes a full trip around the Earth in the exact time period in which the earth rotates once on its axis. A geostationary orbit permits a satellite to be seen directly overhead, continuously, at only one point in the Earth's surface, and is also called a 24-hour orbit or a synchronous orbit.

GETTERING PUMP
The final stage pump system used in extremely high vacuum systems where several different kinds of pumps are employed in series to remove gas from the system.

GETS
Ground Equipment Test Set.

GFE
Government Furnished Equipment.

GFP
Government Furnished Property.

GIMBAL
(1) A device with two mutually perpendicular and intersecting axes of rotation. Provides a free angular movement in two directions, on which an engine or other object may be mounted.
(2) In a gyro, a support which provides the spin axis with a degree-of-freedom.
See–inner gimbal axis
inter gimbal subassembly
outer gimbal axis

GIMBALLED
Swivelled on two perpendicular and intersecting axes of rotation so that the gimballed part may be inclined in either axis or on a combination of both.

GIMBALLED ACTUATOR
A hydraulically controlled mechanism for vehicle guidance which produces the necessary forces to move vehicle engines in any direction around the centerline of a suspension device holding the engine.

GIMBALLED MOTOR
A rocket motor mounted on a gimbal to correct pitching and yawing.

GNOTOBIOTICS
The study of germ-free animals.

GO, NO-GO
A term used to indicate a condition of a part, component, system, etc., which can have only two parameters. Go (functioning properly) or no-go (not functioning properly).

GODDARD SPACE FLIGHT CENTER GSFC
NASA'S Goddard Space Flight Center is responsible for development of unmanned sounding and Earth orbiting spacecraft experiments in basic and applied fields. Goddard also carries prime responsibility for an extensive tracking, data acquisition, and data reduction network. It is located at Greenbelt, Maryland.

GOLDSTONE TRACKING FACILITY
Radio telescope operated for NASA by Jet Propulsion Laboratory (JPL), located at Camp Irwin, Barstow, Calif.

GOSS
Ground Operational Support System.

GOVERNMENT FURNISHED EQUIPMENT GFE
Government furnished property procured and furnished directly to the contractors for inclusion in the system.

GOVERNMENT FURNISHED PROPERTY GFP
Property in the possession of, or acquired directly by the Government, and delivered or otherwise made available to the contractor.

GOVERNMENT INSPECTION
Inspection performed, witnessed or participated in, by the Government inspector.

GOVERNMENT STANDARD
A standard developed by or for a Government activity.

GOX
Gaseous oxygen.

GRADIENTS
See—gravity gradients

GRAIN
Extruded length into which solid propellants are formed.

GRAVIRECEPTORS
Specialized nerve endings and organs in skeletal muscles, tendons, joints, and in the inner ear, furnishing information to the brain on body position, equilibrium, and direction of gravitational forces.

GRAVISPHERE
Spherical extent in which the force of a given celestial body's gravity is predominant in relation to that of other celestial bodies.

GRAVITATION
Force of mutual attraction between all matter in the universe. Varies directly as a product of the bodies' masses and inversely as the square of the distance between them.

GRAVITOMETER
As a part of the scientific instrumentation subsystem, this instrument will provide the capability of determining the direction and magnitude of the Moon's gravitational field.

GRAVITY
Force of gravitation which tends to pull objects toward the center of mass, giving them weight.
See—anti gravity
artificial gravity
center of gravity
specific gravity
zero gravity
zero gravity effect

GRAVITY GRADIENTS
The variation in the force of attraction between two bodies expressed as a function of the separation distance.

GRAVITY WELL
Analogy in which the gravitational field is considered as a deep pit out of which a space vehicle has to climb to escape from a planetary body.

GROSS DESCENT
Initial departure from the equi-period orbit to the point of the hover and translation maneuver.

GROUND COMPUTER COMPLEX
An integral part of the integrated mission control center which will be used to support flight simulations and real time flight control of manned space flight programs.

GROUND ENVIRONMENTAL CONTROL SYSTEM
A system which furnishes air or gaseous nitrogen (GN-2) etc., at the required humidity and temperature to the space vehicle while on the ground to satisfy space vehicle air conditioning and vent gas purging requirements.

GROUND EQUIPMENT TEST SET **GETS**
Test equipment used to verify the operational readiness of certain electrical items of GSE prior to mating with the vehicle.

GROUND OPERATIONAL SUPPORT SYSTEM **GOSS**
Those equipments, excluding the launch vehicle, spacecraft, and launch complex, required to be in operation for direct support of the mission being accomplished. These equipments shall include those used to provide or support mission control, guidance and navigation, tracking, telemetry, communications, logistics and recovery operations.

GROUND SERVICING EQUIPMENT
This includes tow bars, chocks, cradles, dollies, hoists, jacks, ladders, scaffolds, stands, supports, and similar items.

GROUND START
A propulsion starting sequence through ignition to main stage which is initiated and cycled to completion on the ground. This is in contrast to an in-flight or air start where the starting sequence and power buildup occur in flight at sometime after launch. In large rocket vehicles this ground start is commonly effected from pressurized propellant tanks external to the missile, permitting the vehicle to take off with its internal propellant load intact.

GROUND SUPPORT EQUIPMENT **GSE**
The equipment on the ground, including all implements, tools, and devices (mobile or fixed), required to inspect, test, adjust, calibrate appraise, gauge, measure, repair, overhaul, assemble, disassemble, transport, safeguard, record, store, or otherwise function in support of a missile or vehicle, either in the research and development phase or in an operational phase, or in support of the guidance system used with the vehicle.

GSE
Ground Support Equipment.

GSE CALIBRATION EQUIPMENT
Equipment which is required to calibrate the ground support equipment. Consists of general purpose laboratory and calibration instruments such as oscilloscopes, meters, counters, oscillators, gages, etc.

GSFC
Goddard Space Flight Center.

GUIDANCE
The process of directing the movements of an aeronautical vehicle or space vehicle, with particular reference to the selection of a flight path or trajectory.
See—celestial guidance
homing guidance
inertial guidance

GUIDANCE AND CONTROL SYSTEM

Comprised of the guidance and navigation system and the stabilization control system.

GUIDANCE AND NAVIGATION SYSTEM

An inertial guidance system in the Apollo spacecraft which provides boost monitoring capability during Earth launch and Earth parking orbit and guidance during all other phases of spacecraft operation. Separate systems are located in the command module (CM) and the lunar excursion module (LEM). Major guidance and navigation system components located in the CM are:

(1) Inertial Measurement Unit (IMU)
(2) Sextant (SXT)
(3) Apollo Guidance Computer (AGC)
(4) Scanning Telescope (SCT)
(5) Display and Controls (D&C)
(6) Power and Servo Assembly (PSA)
(7) Coupling Display Units (CDU)

GUIDANCE SYSTEM

One of the systems in a space vehicle designed to put the vehicle on a desired trajectory at a desired velocity prior to thrust cutoff, or a system in a vehicle that establishes the desired path from launch to target.

multiple-mode guidance system

GYRO DRIFT

The angular rate of change of the spin axis of the gyro as it deviates from ideal performance.

GYROSCOPE

A device which utilizes the angular momentum of a spinning rotor to sense angular motion of its base about one or two axes at right angles to the spin axis. Also called gyroscope.

See—cryogenic gyro
electrostatic gyro
inertial reference integrating gyro

H

H-1 ENGINE
A liquid-propellant rocket engine designed to develop 188,000 pounds of thrust at sea level. The H-1 uses liquid oxygen (LOX) and kerosene-base fuel (RP-1) as propellants and is used in the first stage of the Saturn launch vehicle.

HALF-STAGE
A booster unit in a stage-and-a-half rocket. One or more separate rocket engines that utilize the same fuel supply as the main engine. The booster engines are jettisoned at a predetermined point and the main engines use up the remaining fuel.

HANDLING EQUIPMENT
That equipment utilized for handling vehicle stages and their subassemblies. This includes hoisting and transporting equipment.

HANDLING RING
A metal ring which can be affixed to the stage external structure. The ring provides an attachment point for hoisting and a support point for the stage in the transporter or other horizontal supporting device.

HANGFIRE
The delayed ignition of the propellant or the igniter.

HARD LANDING
The deliberate destructive impact of a space vehicle on a predetermined celestial target. The vehicle is destroyed upon impact, hence "hard landing". The object of such a space shot is to test propulsion and guidance to prepare the way for a soft landing.

HARD MOCK-UP
A full-size replica of a spacecraft vehicle or engine incorporating all hardware, such as instrumentation, for demonstration, training, and testing.

HARD VACUUM
A vacuum which approximates the vacuum of space.

HARDWARE **HDW**
The physical objects, as distinguished from their capability or function.

HARDWARE UTILIZATION LIST
A listing on the quantity of end item hardware used for test purposes.

HARDWIRE LINK
Direct connection of the vehicle measuring system to the recording system through wire.

HARNESS ASSEMBLY (ELECTRICAL)
Consists of two or more conductors laced or jacketed together and assembled with connectors.

HDW
Hardware.

HEAT EXCHANGER
A device for transferring heat from one substance to another, as by regenerative cooling.

HEAT SINK
A relatively cool area in a system which contains or dissipates heat.

HEATING
See—aerodynamic heating
convective heating

HEAVISIDE LAYER
Region of the ionosphere that reflects radio waves back to earth. Also called kennelly-heaviside layer.

HEAVY COSMIC RAY PRIMARIES
Positively charged nuclei of elements heavier than hydrogen and helium up to, but not including, atomic nuclei of iron. Comprising about one percent of the total cosmic ray particles.

HELIOCENTRIC
Measured from the center of the Sun. Related to, or having the Sun as a center.

HELIUM PRESSURIZATION SPHERE
Spherical pressure vessels used for the storage of helium gas. Used in the propellant tanks, helium is released under pressure to provide proper ullage in the propellant tanks.

HEMISPHERICAL EMITTANCE
Emittance radiating in all directions from the surface.

HERMETIC SEALING
Made perfectly airtight by, or as by, fusion so that no gas or liquid can enter or escape.

HETEROGENEITY
A state or quality. Not originating within the body.

HETEROSPHERE
That part of the upper atmosphere wherein the relative proportions of oxygen, nitrogen, and other gases are unfixed and wherein radiation particles and micrometeoroids are mixed with air particles.

HIG
Hermetically-sealed, Intergrating Gyros.

HIGH VACUUM
The condition in a gas filled space defined as a pressure, less than some upper limit, such as one millimeter of mercury.

HIGH-ENERGY RADIATION
Penetrating particle or electromagnetic radiation of more than a few thousand electron volts, including electrons, neutrons, protons, mesons x-rays and gamma rays.

HIGH-MASS FRACTION
High value of the ratio of propellant weight to total motor weight. Values of 0.9 and greater characterize high-mass fraction motors.

HIGHWATER
Study program of ionospheric effects of ice cloud created from water ejected from Saturn boosters.

HINGE MOMENT
A measure of the tendency of aerodynamic forces acting on control surfaces to produce motion about the hinge axis of the surface.

HOHMANN ORBIT
Proposed minimum energy paths of flight from earth's orbit to orbits of other planets.

HOLD
Scheduled or unscheduled delay or pause in the launching sequence or countdown of a missile or space vehicle.

HOLDDOWN TEST
Testing of a system or subsystem in a missile or other vehicle while the vehicle is restrained in a stand.

HOLDING FIXTURE
A device or equipment used to support and position the upper launch vehicle stages and the spacecraft modules during test, checkout, and handling operations.

HOLDING POND
A man made basin into which spilled propellants, deluge water, and washdown water are drained from the launch pad, launcher area and launcher platform. The pond is so constructed that the water can be drained and the propellants, such as RP-1 fuel, can be skimmed for disposal. The holding pond is also known as a skimming basin.

HOMING GUIDANCE
The guidance of a missile or other vehicle by using an internal receiver that is sensitive to infrared or electronic emissions at the objective.

HOMOSPHERE
That part of the atmosphere made up of atoms and molecules found near the Earth's surface and retaining the same relative portions of oxygen, nitrogen, and other gases.

HORIZONTAL PRE-FLIGHT CHECKOUT SYSTEM
Check-out is accomplished with the vehicle in a horizontal position, thereby reducing the requirements for gantries, cranes, and similar items. Upon completion of checkout, vehicle is erected into vertical firing position. This system is generally usable with smaller vehicles and spacecraft.

HOT TEST
A propulsion system test conducted by actually firing the propellants.

HOUSING
Covering or structures used to enclose space vehicle assemblies and operations.

HOVER
A flight condition in which the craft remains in a relatively fixed position in flight with respect to some object.

HOVER AND TRANSLATION MANEUVER
Manipulation of the lunar excursion module, during the lunar descent phase, to remain at a stationary altitude with respect to the lunar surface and to move in a lateral direction above the landing area.

HP
Horsepower.

HUMAN ENGINEERING
The application of scientific knowledge concerning human limitations and performance capabilities to the establishment of requirements for the accomplishment of the mission. The purpose is to minimize demands upon human skill, training and manpower resources, and to maximize the effectiveness of man-equipment combinations.

HUMAN ERROR
Inaccuracy, mistake, or inconsistency due to the inherent characteristics of man.

HUMAN FACTORS
Used in a broad sense to cover all biomedical and psychosocial considerations pertaining to man in the system. It includes principles and applications in the areas of human engineering, personnel selection training, life support requirements, job performance aids and human performance evaluation.

HYBRID COMPUTER
A computer of heterogeneous composition, e.g., an analog to digital computer as opposed to straight analog or straight digital computers.

HYBRID MOTOR
A rocket-propulsion unit that burns a combination of propellants of different composition and characteristics (a liquid oxidizer and a solid fuel) to produce a propulsive force.

HYDRAZINE-BORANE
Propellant ingredients derived from borane compounds and hydrazine.

HYDRODYNAMIC
The physics of the motion of fluids, especially water.

HYDROGEN H
Lightest chemical element, flammable, colorless, tasteless, odorless gas in its uncombined state. Used in liquid state as a rocket fuel.
See—liquid hydrogen
liquid hydrogen (LH-2) system complex

HYDROGEN-FLUORINE
High energy liquid propellants for rocket engines. Hydrogen is the fuel and fluorine is the oxidizer.

HYDROSPHERE
The water envelope of a planet.

HYDROSTATIC EFFECTS
The pressures exerted by a column of liquid under normal gravitational conditions on the surface of the earth or in a gravitational field during an acceleration.

HYPERACOUSTIC ZONE
The region in the upper atmosphere where the distance between the rarefied air molecules equals the wave length of sound, so that sound is transmitted with less volume than at lower levels. Above this zone, sound waves cannot be propagated.

HYPERBOLA
A conic section made by a plane intersecting a cone of revolution at an angle smaller than that of a parabola. The value of its eccentricity is greater than one.

HYPERBOLIC REENTRY
Reentry at speeds above 37,000 feet per second.

HYPERGOL
A rocket fuel or propellant that ignites spontaneously upon contact with the oxidizer. A propulsion system that utilizes such a fuel.

HYPERGOLIC FUEL
Rocket fuel that ignites spontaneously upon contact with the oxidizer, thereby eliminating the need for an ignition system.

HYPERSONIC
Velocities of five or more times the speed of sound in the surrounding medium.

HYPERSONIC FLOW
In aerodynamics, flow of a fluid over a body at speeds much greater than the speed of sound and in which the shock waves start at a finite distance from the surface of the body.

HYPERVELOCITY GUN
Test equipment for accelerating particles to velocity range attained by meteoroids in space. The equipment is used in investigations of meteoroid damage and methods of meteoroid protection.

HYPERVELOCITY NEUTRAL BEAM
A directed stream of neutrons, moving at extremely high speed.

HYPOXIA
Oxygen deficiency in the blood cells or tissues of the body in such degree as to cause psychological and physiological disturbances. Hypoxia may result from scarcity of oxygen in the air being breathed. Or from inability of the body tissues to absorb oxygen under conditions of low barometric pressure. Compare with anoxia.

IA
Input axis of the IRIG or the PIP. The axis which is perpendicular to the output axis and at 90 degrees from the IRIG spin reference axis or the PIP pendulous reference axis. Movement along this axis results in a displacement of the signal generator which indicates, respectively, angular motion in the IRIG'S reference plane or acceleration in the PIPA'S reference plane.

IA FREEDOM
The angle of rotation from null position permitted by mechanical stops in the IRIG and the PIP.

IC
Inertial Component.

ICE FROST
Ice on the outside of a rocket vehicle over surfaces supercooled by liquid oxygen.

ICTE
Inertial Component Test Equipment.

IFTS
In-Flight Test System.

IGA
Inner Gimbal Axis.

IGNITION
The initiation of combustion of a rocket engine.

IGNITION LAG
The time interval measured from the instant that electrical contact is made to the first perceptible rise of pressure or thrust (whichever occurs first).

IGS
Inter Gimbal Subassembly.

IGY
International Geophysical Year.

ILCCS
Integrated Launch Control and Checkout System.

IMCC
Integrated Mission Control Center.

IMMEDIATE ENVIRONMENT
The environmental conditions local and surrounding each individual part under the conditions of specified end use.

IMP
Inflatable Micrometeoroid Paraglider.
Interplanetary Monitoring Probe.

IMPLEMENTATION
The process of putting into effect and accomplishing a program plan.

IMPORTANCE FACTOR OR CRITICALITY FACTOR
The relative importance of the particular system to the total mission effectiveness. The ratio of the number of mission failures due to the equipment failing to the total number of failures of the equipment.

IMPULSE
A sudden unidirectional force of non-repeated form or character.
See—specific impulse

IMU
Inertial Measurement Unit.

IMU GROUND SUPPORT EQUIPMENT **IMUGSE**
Proposed module of equipment which could be used to operate the IMU during development, manufacturing, and test phases.

IMUGSE
IMU Ground Support Equipment.

IN-FLIGHT TEST SYSTEM **IFTS**
A test system in the command module (CM) for providing the flight crew with a rapid check on the status of the spacecraft systems and for isolating a malfunction. The system provides a centralized panel with a go-no-go test point readout and a coded readout, showing which system or subsystem failed. A means for manual testing and maintenance instructions is provided.

INCIDENT RADIATION
Radiant energy impinging on a surface per-unit-time and per-unit-area. Also called irradiation or flux density.

INCLINATION
An angle between two lines or two planes such as the angle between the plane of an orbit and a reference plane.

INDEPENDENT FAILURES
Those failures which occur or can occur without being related to the malfunctioning of associated items.

INDEPENDENT VARIABLE
Arbitrary variable which the designer has some freedom to establish. Once selected, the variable influences such sys-

tem characteristics as performance and weight at the design point.

INDICATORS
Instruments which interpret and present information pertaining to conditions or situation at a distant or inconvenient place.
See—multiple-legend indicator lights

INDIVIDUAL OPERATIONAL TEST
A test performed on all equipments to insure operation for major characteristics only. This type of test usually precedes an individual reliability test.

INDIVIDUAL RELIABILITY TEST
This is usually a burn-in of all equipment for a specified time. During the course of the test changes in major characteristics, as established in the individual operational tests, are studied and corrective action taken.

INDUCED ENVIRONMENT
The state or conditions which exist due to the interaction of the natural environment and the test subject.

INDUSTRY STANDARD
A standard developed and promulgated by a technical society, trade association, or federation.

INERTIA WHEEL
A rotating mass used to absorb minor torques created during the stabilization and control of a spacecraft.

INERTIAL COMPONENT **IC**
The inertial reference intergrating gyros (IRIG) and the pulsed intergrating pendulum (PIP) that establish the inertial reference plane or sense accelerations. These components are located in the inertial measurement unit (IMU).

INERTIAL COMPONENT TEST EQUIPMENT **ICTE**
The complex of units designed to perform all acceptance, performance surveillance and preassembly tests of the inertial components of the inertial measurement unit (IMU).

INERTIAL FORCE
The force produced by the reaction of a body to an accelerating force, equal in magnitude and opposite in direction to the accelerating force. Inertial force endures only as long as the accelerating force endures.

INERTIAL GUIDANCE
A type of guidance for a missile or space vehicle effected by means of mechanisms that automatically adjust the vehicle after launching to follow a given flight path. The mechanisms measure inertial forces during periods of acceleration, integrate the data obtained with already-known position and velocity and signal the controls to effect the desired direction, altitude, etc.

INERTIAL MEASUREMENT UNIT **IMU**
A three-gimbal stabilized platform which consists of pulsed integrating pendulum accelerometers (PIPA), inertial reference integrating gyros (IRIG) and resolver output.

INERTIAL PLATFORM
A gyro-stabilized reference platform. Part of a guidance system.

INERTIAL REFERENCE INTEGRATING GYRO **IRIG**
A single-degree-of-freedom gyro. It contains a gyro wheel, a floated gimbal in which the wheel is mounted, a torque generator, and a signal generator. Three IRIG's mounted on the stable member maintain a reference for the nonrotating space-oriented axes of the IMU.

INFANT MORTALITY
Premature destructive failure occurring at a rate substantially greater than observed during subsequent life prior to wearout. Infant mortality may be reduced by stringent quality control and eliminated by appropriate screening.

INFLAMMABLE
Capable of bursting into flame when a spark or open flame is passed sufficiently near, as with fumes and vapors from hot oils or volatile combustible liquids and with finely powdered combustible solids.
See—flammable

INFLATABLE MICROMETEOROID PARAGLIDER **IMP**
Recoverable system for measuring meteoroid flux in near space.

INFRARED
Electromagnetic radiation in the wavelength interval from the red end of the visible spectrum on the lower limit to microwaves used in radar on the upper limit.

INFRARED LIGHT
Light in which the rays lie just below the red end of the visible spectrum.

INGRESS
The act of, or the mechanism for, entrance to an enclosure. In spacecraft this can relate to the act of a crew member entering the space vehicle or it can describe the entrance chamber, pressure lock and hatchways.

INHERENT RELIABILITY
The reliability potential in the design as determined prior to manufacturing, handling, transportation, maintenance, storage and use.

INHIBITOR
A substance bonded, taped or dip-dried, onto a solid propellant to restrict the burning surface and to give direction to the burning.

INITIAL FAILURE
The first failure to occur in use.

INITIATOR
A unit which receives electrical or detonation energy and produces a chemical deflagration reaction.

INJECTION
The process of putting an artificial satellite into orbit. Also the time of such action.
See—Ion injection
lunar trajectory injection vehicle

INJECTION ALTITUDE
Height at which the vehicle is turned from its launch trajectory into an orbital trajectory.

INJECTION VEHICLE
The launch vehicle system which provides for the injection of the spacecraft into a lunar transfer orbit.
See—lunar trajectory injection vehicle

INJECTION WEIGHT
The weight of the vehicle at the termination of one phase of a mission that is continued in the succeeding phase.

INLET
An entrance or orifice for the admission of fluids or gases.
See—variable geometry inlet

INNER GIMBAL AXIS **IGA**
The axis of rotational freedom between the stable member and the middle gimbal of the IMU.

INSEPARABLE ASSEMBLY DRAWING
Depicts items permanently joined to form an integral unit.

INSP
Inspection.

INSPECTION **INSP**
The process of measuring, examining, testing, gaging, or otherwise comparing the unit of product with the applicable requirements.
See—acceptance inspection
average total inspection
comparison inspection
destination inspection
development engineering inspection
mock-up inspection
normal inspection
one hundred percent inspection

INSPECTION BY ATTRIBUTES
Inspection wherein the unit of product is classified simply as defective or non-defective with respect to g given requirement or set of requirements.

INSPECTION BY VARIABLES
Inspection wherein a specified quality characteristic of a unit or product is measured on a continuous scale and recorded.

INSPECTION LEVEL
Used to indicate the relative number of sample units for a given amount of product. All other things being equal, a higher inspection level entails a lower risk of acceptance of a lot of inferior quality.

INSPECTION LOT
A collection of units of product manufactured or processed under substantially the same conditions and offered for inspection at one time or during a fixed period of time.
See—moving inspection lot

INSTALLATION
A system of machinery or apparatus placed in functional position for use.

INSTALLATION DRAWING
Shows general configurations, attaching hardware, and information to locate, position, and mount an item relative to fixed points and to other items.

INSTRUMENT UNIT **IU**
In the Saturn series, an adapter section or module between the launch vehicle and spacecraft. It houses the guidance systems, telemetry equipment, power supply, RF systems and in-flight instrument-unit air conditioning equipment.

INSTRUMENTATION
The installation and use of electronic, gyroscopic, and other instruments and sensors for the purpose of detecting, measuring, recording, telemetering, processing, or analyzing different values or quantities as encountered in the flight of a missile or spacecraft. Instrumentation applies to both flight-borne and ground-based equipment.
See—red-line instrumentation

INSTRUMENTATION SYSTEM
Combined measuring and telemetering systems.

INTEG
Integration.

INTEGRAL TANK
A fuel or oxidizer tank built within the normal contours of the aircraft or missile and using the skin of the vehicle as part of the walls of the tank.

INTEGRATED MISSION CONTROL CENTER **IMCC**
The IMCC, located at Clear Lake, near Houston, will have the capability of monitoring the spacecraft and directing the support elements for all phases of the Apollo missions, including unmanned and manned Earth-orbital and lunar flights. The IMCC utilizes the services provided to it by the Launch Control Center, the Global Tracking and Communication Networks, the computer complex at Houston, the recovery control centers and forces, and the data reduction facilities.

INTEGRATION **INTEG**
The process of assuring that the major elements of a program be conceived, designed, assembled, tested, operated, and documented in such a manner as to be compatible with each other and to satisfy the program objectives.

INTEGRATION, TRANSPORT AND LAUNCH CONCEPT
A concept where space vehicle assembly, payload integration, and complete checkout are performed in an area remote from the launch pad and the entirely assembled space vehicle system is transported to the launch pad to be fueled.

INTER GIMBAL SUBASSEMBLY IGS
The subassembly by which the gimbal case, gimbals, and stable member are attached to each other.

INTERACTION EFFECT
Those effects which various components, subsystems, and systems demonstrate when combined into higher level assemblies.

INTERCHANGEABILITY
A condition of design ensuring that all mating parts will assemble and function properly without the need for any selecting, machining or fitting at assembly.
See—complete interchangeability
selected interchangeability

INTERCHANGEABLE ITEM
When two or more items have the same functional and physical characteristics as to be equivalent in performance and durability and are capable of being exchanged one for the other.

INTERCONNECTING CABLE
An assembly of one or more insulated, parallel, or twisted electrical conductors having both ends terminated with fittings for connections to components, subsystems, and systems.

INTERCONNECTION DIAGRAM
A diagrammatic drawing that shows the external connections between assemblies or systems.

INTERDEPENDENT ASSEMBLY OR UNIT OF EQUIPMENT
Dependent upon one or more other parts of the design item in order to perform its intended function.

INTERFACE
The point or area where a relationship exists between two or more parts, systems, programs, persons, or procedures wherein physical and functional compatibility is required.

INTERFACE DRAWING
The engineering drawing which graphically or discriptively displays the conditions of the interface which exist between assemblies.

INTERFACE PROBLEMS
Problems which pertain to a boundary common to two or more components or functions.

INTERFERENCE FIT
One having limits of size so prescribed that an interference

INTERFEROMETER
An apparatus used to produce and measure interference from two or more coherent wave trains from the same source.

INTERIOR BALLISTICS
The branch of ballistics concerned with the behavior, motion, appearance, or modification of a missile when acted upon by the ignition and burning of a propellant.

INTERNATIONAL QUIET SUN YEAR IQSY
In 1965, solar flares and disturbances will be at a periodic low level, during which, scientists throughout the world will cooperatively engage in the study of the Sun.

INTERPLANETARY
Between planets.

INTERPLANETARY MONITORING PROBE IMP
Designed to provide detailed measurement of the radiation environment between Earth and Moon. Characteristics of particle fluxes from the Sun, the interplanetary magnetic field, and solar-terrestrial relationship will be studied.

INTERQUARTILE RANGE
The distance between the upper and lower quartiles.

INTERSTAGE
Between stages.

INTERSTELLAR
Between stars.

INVERTER
An electrical or electronic device for the conversion of electrical power from DC to AC.

IOC
Initial Operational Capability.

ION
An electrically charged atom or group of atoms. A positively charged ion is an atom or group of atoms with a deficiency of electrons. A negatively charged ion is an atom or group of atoms with an added electron.

ION BEAM NEUTRALIZATION
The supplying of negatively charged electrons to a positively charged high velocity stream of ions in order to provide a neutral or uncharged stream that will not be slowed down or held by the electrostatic field in an ion jet.

ION CHAMBER
An instrument used to determine the presence of charged particles.

ION ENGINE
Projected type of engine in which the thrust to propel the missile or spacecraft is obtained from a stream of ionized atomic particles, generated by atomic fusion, fission, or solar energy.

ION INJECTION
The introduction of ions into the interelectrode area of a thermionic generator to enhance the flow of electrons through neutralization of the space charge.

ION JET
An electric rocket system in which positively charged particles are generated and subsequently accelerated and ejected by the use of a negatively charged electric field.

ION SOURCES
The component of an ion jet that removes electrons from the propellant to produce positively charged ions.

IONIZATION
Being ionized or being dissociated into ions.
See—contact ionization
surface ionization

IONIZE
Change into ions, become electrically charged, as a gas under the influence of heat, electron bombardment, and nuclear radiation.

IONIZED LAYERS
Layers of increased ionization within the ionosphere. Responsible for absorption and reflection of radio waves and important in connection with communication and the tracking of satellites and other space vehicles.

IONIZED PLASMA SHEATH
A layer of ionized particles closely surrounding an electrode. Especially such a layer around a spacecraft during reentry when it may interrupt or interfere with ground spacecraft communications.

IONOSPHERE
An outer belt of the Earth's atmosphere in which radiations from the Sun ionize, or excite electrically, the atoms and molecules of the atmospheric gases.

IQSY
International Quiet Sun Year.

IRIG
Inertial Reference Integrating Gyro.
Inter-Range Instrumentation Group (NASA).

IRIS
A solid-propellant upper atmosphere sounding rocket.

IRRESOLVABLE COMPONENTS
Those components which cannot be separated into component parts or whose internal configuration or operation is withheld from the user by a proprietory information agreement.

ISOSTATIC
Under equal pressure from every side.

ISOTHERMAL REGION
The stratosphere considered as a region of uniform temperature.

ISOTROPIC
In general, pertaining to a state in which a quantity or spatial derivitives thereof are independent of direction.

IU
Instrument Unit.

IVORY TOWER
Colloquial term for vertical test stand.

J

J-2 ENGINE
A liquid-propellant rocket engine which supplies about 200,000 pounds of thrust at altitude.

JERK
A vector that specifies the time rate of change of an acceleration. The third derivative of displacement with respect to time.

JET
See—control jet
plasma jet

JET EDUCTOR
A device used in conjunction with a fuel transfer pump to drain the fuel transfer line. Part of the RP-1 fuel system complex.

JET PROPULSION LABORATORY **JPL**
Operated for NASA, under contract, by the California Institute of Technology. Its prime mission is the development of spacecraft for unmanned lunar and planetary space exploration and for operation of a world-wide-deep-space tracking and control network. The main laboratories and offices are in Pasadena, Calif. A test station is located at Edwards, Calif. and the Goldstone Tracking Station, operated by JPL, is on the Camp Irwin Military Reservation about thirty miles north of Barstow, Calif. in the Mojave Desert.

JET STEERING
The use of fixed or movable gas jets on a missile to steer it along a desired trajectory during propelled and coasting flight.

JET STREAM
The stream of gas or fluid expelled by any reaction device. Also, a narrow band of high velocity wind, especially near the base of the stratosphere.

JETAVATOR
A control surface that may be moved into or against a rocket's jet stream to change direction of the jet flow for thrust vector control.

JOB TRAINING STANDARD **JTS**
A standard of proficiency to be attained and maintained by members of a unit, established to assure accomplishment of the mission.

JODRELL BANK
Site of a large radio telescope with a paraboloidal receiver (250 feet in length, sixty feet deep) used to track space probes. Located near Manchester, England.

JPL
Jet Propulsion Laboratory.

JTS
Job Training Standard.

JUNO II
4-stage launch vehicle using Jupiter and Sergeant engines.

K

K-BAND
Frequencies in the region of 30,000 megacycles per second.

KEPLER'S LAWS
Three empirical laws describing the motions of planets in their orbits.
(1) The orbits of the planets are ellipses, with the Sun at a common focus.
(2) As a planet moves in its orbit, the line joining the planet and Sun sweeps over equal areas in equal intervals of time. Also called laws of equal areas.
(3) The squares of the periods of revolution of any two planets are proportional to the cubes of their mean distances from the Sun.

KEPLERIAN TRAJECTORY
Elliptical orbits described by celestial bodies according to Kepler's first law of celestial motion.

KINETICS
The science that deals with the motion of masses in relation to the forces acting on them.

KIT
. *See—modification kit*
transportation handling kit

KIT DRAWING
Depicts a packaged unit, item, or group of items, instructions, photographs, and drawings, used in modification, installation, or survival, but which in themselves do not necessarily constitute a complete functioning engineering assembly. A kit drawing usually includes a listing of all item numbers, commercial products, and hardware to complete a modification or installation.

KIWI
Series of developmental studies by the Atomic Energy Commission with goal of developing nuclear reactors useful in high-thrust rocket engines.

KNOT
A nautical mile.

KURTOSIS
The relative steepness of ascent in the vicinity of the mode in a frequency distribution, peakedness as opposed to flatness.

L

LABORATORY CALIBRATION TEST
Tests to determine if the measuring devices or component is within specifications.

LAMINAR FLOW
A nonturbulent air flow made up of thin parallel layers over and about a nosecone or other surface.

LANDING
See—Earth landing system
hard landing
power landing
soft landing

LANGLEY RESEARCH CENTER **LRC**
One of NASA'S field installations. The mission of the Langley Research Center is research on a broad scale into vehicle configurations, materials and structures for space and aeronautics. It is located at Langley Field, Hampton, Virginia.

LANGMUIR THEORY
The assumption that the extra-nuclear electrons in an atom are arranged in shells corresponding to the periods of the periodic system.

LASER
Light amplification through stimulated electromagnetic radiation. An advanced amplification device using precise crystal cores at very low temperatures.

LATERAL-DIRECTIONAL CROSS-COUPLING
Interaction of two modes of motion of a space vehicle which results in change of the attitude of the vehicle.

LAUNCH
Initial motion in transition from static repose to dynamic flight. The moment when the vehicle is no longer supported by the launcher.
See—vertical launch

LAUNCH AZIMUTH
The angle of the launch plane as measured clockwise from true north.

LAUNCH COMPLEX 34 **LC 34**
A single launch pad configuration used to support the launches of the Saturn I, Block I vehicles. The general launch complex area is composed of the following facilities; Launch pad, launch pedestal, launch deflector, umbilical tower, automatic ground control station (AGGS), service structure, launch control center (LCC), operations support building, RP-1 system, liquid oxygen system, and a high pressure gas system.

LAUNCH COMPLEX 37 **LC 37**
A launch site situated approximately 3800-feet North of Launch Complex 34. The complex consists of two launch pads and is used to support and launch Saturn I, Block II operational vehicles. A significant feature of the complex is the advance design and configuration which permits the accomplishment of an accelerated launch schedule in support of the preliminary requirements of the Saturn V.

LAUNCH COMPLEX 39 **LC 39**
This complex, to be erected at the Merritt Island Launch Area (MILA), will provide the facilities and equipment required to receive, assemble, checkout, and launch Saturn V vehicles with payloads. It incorporates the mobile concept of launch operations which employs the following basic features;
(1) Vertical assembly of the entire launch vehicle in a specially equipped building away from the launch pad.
(2) Transfer to launch pad is accomplished with the vehicle assembled in a vertical position on the launcher.
(3) Automatic checkout of components and systems will be provided with the capability of continuous checkout.

LAUNCH CONTROL CENTER **LCC**
Centralized over-all control point for all phases of prelaunch and launch operations at the launch facility on a specific program. Handover of control to mission control center occurs at separation of the space vehicle from all hard ground connections.

LAUNCH ESCAPE PROPULSION SYSTEM **LEPS**
A cluster of solid propellant motors mounted atop the command module. The motors generate sufficient thrust to remove the command module from the booster in event of booster failure.

LAUNCH ESCAPE SYSTEM **LES**
A tower-like structure mounted on top of the command module. Propulsion is provided by a solid-fuel motor with step or regressive burning characteristics. The LES provides an abort capability, until after it is jettisonned following second-stage ignition, by removing the command module (CM) to a safe distance from the launch vehicle in the event of a booster failure or imminent failure.

LAUNCH ESCAPE SYSTEM SIMULATOR
An auxiliary item of equipment used to facilitate spacecraft systems checkout, through simulation of actual launch escape system functions. When connected to the command module (CM), the simulator receives and measures electrical signals, determines from signal characteristics if the signals would reliably operate the launch escape systems, and

transmits results of measurement and analysis to the CM system test group. Specific launch escape system functions to be simulated include; yaw, engine start, thrust-chamber nozzle start, and jettison-motor start.

LAUNCH OPERATION CENTER **LOC**
Responsible for the over-all planning and supervision of the integration, test, checkout, and launch of space vehicle systems at the Atlantic Missile Range.

LAUNCH PAD
The load-bearing base or platform from which a rocket vehicle is launched. Usually called pad.

LAUNCH PEDESTAL
A reinforced concrete or steel structure which is capable of supporting and retaining space and launch vehicles in a launch attitude. The launch pedestal is sometimes called launch pad or considered part of the launch pad.

LAUNCH RING
The metal ring on the launch pad on which a missile stands before launch.

LAUNCH SUPPORT AND HOLDDOWN ARM
Equipment which provides direct support for a portion of the dead weight of the space vehicle and retains the vehicle on the launch pad or platform during the thrust buildup period. It is part of the launch support and holddown arm system and is usually located and anchored at the top of the launch pedestal or platform.

LAUNCH SUPPORT ARM
Part of the launch support and holddown arm system.

LAUNCH UMBILICAL TOWER **LUT**
A deep truss frame platform upon which a steel tower-like structure, which is used to support and service the umbilical arms, is located. The tower also supports and houses equipment required to perform certain service and checkout functions on the space vehicle prior to launch.

LAUNCH VEHICLE **LV**
The part of the space vehicle which furnishes the propulsion and guidance during the initial part of the trajectory to provide the prescribed velocity, position, and attitude required for injection into the desired trajectory. Launch vehicles are commonly called boosters and consist of two or more propulsive stages.

See—operational launch vehicle

LAUNCH VEHICLE SIMULATOR
Equipment that presents to the service and command module (CSM) an interface which is electrically similar to the launch vehicle. It accepts control signals from the CSM and produces system responses to facilitate a complete functional checkout and test of the command and service module functions.

LAUNCH VEHICLE SYSTEM
The launch vehicle (flight hardware) and all equipment associated with flight preparation.

LAUNCH WINDOW
The mission conditions which impose launch time limitations on the launch vehicle for any given trajectory such as relative position of Earth and moon or planets, mid-course propulsion capabilities, guidance limits, etc.

LAUNCHER
A device for holding the space vehicle in its intended launching attitude and for imparting control and thrust (catapult) during its initial phase of movement until it becomes airborne.

See—transporter/launcher

LAUNCHER DEFLECTOR
Device composed of steel or reinforced concrete, or a combination of both, which deflects the booster engine flame into controlled directions.

LAUNCHER-TRANSPORTER
Mobile steel frame (crawler-type) vehicle which transports the arming tower between pads, and launcher/umbilical towers and space vehicles between the vertical assembly building and pads.

LAYER

See—boundary layer
heaviside layer
ionized layers

LCC
Launch Control Center.

LEAKAGE SYSTEM

See—controlled leakage system

LEM
Lunar excursion module.

LEM PROPULSION SYSTEM
A propulsion system in the lunar excursion module (LEM) designed to provide velocity increments in the LEM for descent, touchdown, ascent, and rendezvous.

LEM TRUCK
The unmanned version of the lunar excursion module capable of delivering 4,000 to 7,000 pounds payload to the lunar surface.

LENGTH OF LIFE
The term "length of life" and "time to failure" shall be used interchangeably and shall denote the length of time it takes for a unit of product to fail after being placed on life test.

LENGTHY TARRYING CAPABILITY
The ability to remain in the vicinity of a planetary body for a considerable period of time, as in orbit.

LENTICULAR SHAPES
Reentry configurations having the general shape of a convex lens.

LEO
Librating Equidistant Observer (satellite concept).

LEPS
Launch Escape Propulsion System.

LES
Launch Escape System.

LEVEL
See—acceptable quality level
acceptable reliability level
inspection level
significance level
sound plane level

LEVELED THRUST
A rocket power plant equipped with a programmer or engine-control unit that maintains the output at a relatively constant thrust.

LEWIS RESEARCH CENTER LRC
Initiates and conducts basic and applied research in propulsion and space flight, located at Cleveland, Ohio.

LIBRATION
A real or apparent oscillatory motion, particularly the apparent oscillation of the Moon.

LIFE SCIENCE
Generally used to describe the science of adapting the physiological and psychological requirements of man to spacecraft and space flight.

LIFE SUPPORT
The term encompasses the entire areas of biological, physiological, and medical sciences which provide the basic data to define and establish the physiological criteria required to insure maximum pilot safety.

LIFE TEST
Those tests conducted to verify and qualify hardware from an endurance or life standpoint. Life test shall be conducted at design levels for the required operational cycles.

LIFE-TEST MODEL
Prototype equipment operated until it fails to determine its life expectancy.

LIFT DRAG RATIO
The ratio of the lifting force to the drag force for either an isolated wing or a complete aircraft. This ratio is used in determining the rate of descent of a space vehicle in the atmosphere.

LIFTOFF
The initial motion of a space vehicle or ballistic missile as it rises from the launch stand. The takeoff.

LIGHT FILTER TRANSMITTANCE
The ratio of transmitter light to incident light, uncorrected for surface reflection losses.

LIMIT
See—confidence limits
nominal stress limits
nonstressed limits
probability limits
sigma limits
stressed limits
minimum material limit

LIMIT DIMENSIONING SYSTEM
Indicates the largest and smallest permissible dimensions.

LIMIT LOAD
The maximum load calculated to be experienced by the structure under specified conditions of operation.

LIMIT PRESSURE
The maximum operating pressure or operating pressure including the effect of system environment, such as vehicle acceleration, etc. For hydraulic and pneumatic equipment, limit pressure will exclude the effect of surge.

LIMITED LIFE ITEMS
Items that because of their nature have a life which exceeds the ground checkout time plus the mission time, but which normally would require replacement or refurbishing before the next mission.
See—critical and limited life item refurbishment

LIMITED SUBSTITUTE
An item that can replace or be replaced by another item under certain conditions or in some particular applications.

LIMITS OF A DIMENSION
The maximum and minimum values acceptable for that dimension.

LINE OF POSITION
In navigation, a line representing all possible locations of a craft at a given instant.

LIQUID HYDROGEN
Supercooled hydrogen gas, usually used as a rocket fuel.

LIQUID HYDROGEN SYSTEM COMPLEX
Refers to all the facilities and facility equipments used for receiving, handling, storing, pressurizing, conditioning, controlling, and monitoring the liquid hydrogen (LH-2) from time of receipt at the pad to the loading of the vehicle tanks.

LIQUID OXYGEN LOX
Supercooled oxygen used as the oxidizer in many liquid fuel engines.

LIQUID OXYGEN (LOX) SYSTEM COMPLEX
Refers to all the facilities and facility equipments used for receiving, handling, storing, pressurizing, conditioning, controlling, and monitoring the LOX from time of receipt at the LOX pad to the loading of the vehicle tanks.

LIQUID PROPELLANT
A liquid ingredient used in the combustion chamber of a rocket engine.

LIQUID-AIR CYCLE ENGINE
An advanced engine cycle which uses liquid hydrogen fuel to condense air entering an inlet. Liquid oxygen is separated from the condensed air and pumped to the combustion chamber where it is burned with the hydrogen to produce thrust.

LITTLE JOE
Mercury test launch vehicle.

LITTLE JOE II
Apollo test launch vehicle.

LIVE
Lunar Impact Vehicle.

LLS
Lunar Logistics System.

LLV
Lunar Logistics Vehicle.

LOAD
See—dynamic load
fatigue loads
limit load
thermal load
yield strength load factor

LOAD ALLEVIATOR
See—frangible tube load alleviator
multiable air bag load alleviator

LOAD FACTOR
The factor by which the steady-state loads are multiplied to obtain the equivalent static effect of dynamic loads.
See—yield strength load factor

LOC
Launch Operations Center.

LOCAL VERTICAL
The direction in which the force of gravity acts at a particular point.

LOCALIZATION
The procedure for determining the failed component in a system or equipment.

LOCATION DIMENSION
Specifies the position or distance relationship of one feature of an object with respect to another.

LOCKUP
The differential between output pressure with zero flow and output pressure with rated flow.
See—dynamic lockup

LOGIC DIAGRAM
A diagrammatic drawing that employs logic symbols with interconnecting lines to illustrate system operation.

LOGISTIC REQUIREMENTS
Material requirements established as necessary to maintain or restore a system to an operational status.

LONGITUDINAL AXIS
The fore-and-aft line through the center of gravity of a craft.

LOR
Lunar Orbit Rendezvous.

LORAN
Long Range Navigation.

LOT
Consists of units of product manufactured to the same requirements of contract, drawings, and specifications under the same manufacturing methods. Maximum and minimum lot sizes shall be to specific instructions.
See—inspection lot

LOT QUALITY
The ratio of the number of units defective to the total number of units.

LOT SIZE
A specific quantity of similar material, collection, or similar units from a common source. In inspection work, the quantity offered for inspection and acceptance at any one time. It may be a collection of raw material, parts, or subassemblies, inspected during production or a consignment of finished product to be sent out for service.

LOW EARTH ORBIT
An orbit which is not high enough for the spacecraft to stay in space for an infinite length of time. A decaying orbit.

LOX
Liquid Oxygen.

LRC
Langley Research Center.
Lewis Research Center.

LUNAR
Of or pertaining to the Moon.

LUNAR ATMOSPHERE ANALYZER
As a part of the scientific instrumentation subsystem, this instrument provides the capability of determining the quantative and qualitative composition of the lunar atmosphere. It may also be used as a backup component for determining the cabin atmosphere partial pressure in the LEM.

LUNAR EXCURSION MODULE **LEM**
One module of the three-module Apollo spacecraft. It will effect the landing on the Moon. The two-man module will detach from the Apollo spacecraft command and service modules while in lunar orbit, descend to the lunar surface, and then return the two men to the command and service modules.

LUNAR IMPACT VEHICLE **LIVE**
A study of hard landing on the Moon.

LUNAR ORBIT RENDEZVOUS **LOR**
A mode involving rendezvous and coupling, fueling, or transfer in a lunar parking orbit.

LUNAR ROVING VEHICLE
A vehicle designed to facilitate exploration of the lunar surface and to operate as a cargo transporter.

LUT
Launch umbilical tower.

LV
Launch vehicle.

LVOD
Launch Vehicles Operations Division.

LYMAN-ALPHA SCANNER
An instrument used to detect and measure a prominent red line in the spectrum of hydrogen present in the sun's atmosphere.

M

M-1 ENGINE
A liquid-propellant rocket engine. The M-1 engine uses liquid oxygen (LOX) and liquid hydrogen (LH-2) as propellants.

MACH
A unit of speed measurement for a moving object equal to the speed of sound in the medium in which the object travels. Mach I, under standard conditions at sea level, is about 759 miles per hour. It decreases with altitude.

MACH NUMBER
The ratio of a velocity to the speed of sound at ambient conditions.
See—force-break mach number

MAGNETIC LATCHING
A particular type of relay operation wherein one pulse is required for energizing and a second pulse is required for deenergizing (one pulse for setting and a second pulse for reversing the mated contacts).

MAGNETIC MERIDIAN
A great circle of the Earth passing through the magnetic poles.

MAGNETIC STORM
A worldwide disturbance of the Earth's magnetic field.

MAGNETOGRAM
See—solar magnetrogram

MAGNETOHYDRODYNAMICS **MHD**
Flow physics of a partially ionized gas that is accelerated by the interaction of electric and magnetic field forces.

MAGNETOMETER
As a part of the scientific instrumentation subsystem, this instrument will provide the capability for determining the direction and magnitude of the lunar magnetic field.

MAGNETOSPHERE
The Earth's magnetic field in space.

MAGNITUDE
Relative brightness of a celestial body. The smaller the magnitude number, the brighter the body.

MAIN STAGE
In a single stage rocket, it is the period when full thrust is attained. In a multistage rocket, it is the stage that develops the greatest amount of thrust. In a stage and a half rocket, it is the sustainer engine.

MAINT
Maintenance.

MAINTAINABILITY
The quality of the combined features of item design and installation which facilitates the accomplishment of inspection, test, servicing, repair and overhaul with minimum time, skill, and resources.

MAINTAINABILITY INDEX
A quantitative figure of merit which relates the maintainability of a system or equipment to a standard reference.

MAINTAINABILITY PARAMETERS
A group of factors or environmental, human and design features which affect the performance of maintenance on an equipment.

MAINTAINABILITY REQUIREMENT
A comprehensive statement of required characteristics, expressed in quantitative terms, to be incorporated in system, subsystem, and component design.

MAINTENANCE **MAINT**
The function of retaining material in or restoring it to a serviceable condition.
See—field maintenance
organizational maintenance
precautionary maintenance
preventive maintenance

MAINTENANCE ANALYSIS
The process of identifying required maintenance functions and determining the most effective means of accomplishing these functions.

MAINTENANCE COST
The overall expenditure incurred in the support of a system or equipment.

MAINTENANCE ELEMENT
A discrete portion of a maintenance task which can be described and measured.

MAINTENANCE PROFICIENCY
A maintenance technician's ability to use and apply the skills, concepts, and principles necessary for equipment maintenance.

MAINTENANCE TASK
Any action or actions required to preclude the occurrence of a malfunction or restore an equipment to satisfactory operating condition.

MAJOR ASSEMBLY
A combination of detail parts and subassemblies. Issued as an element of an installation, it performs a major function necessary to the operation of the installation and is constructionally relatively complex.

MAJOR DEFECT
A defect, other than critical, that could result in failure or materially reduce the useability of the product for its intended purpose.

MAJOR MEASUREMENT
Actual measurement of the mass properties of a complete vehicle stage or module.

MALFUNCTION
Failure of a product to give satisfactory performance.

MAN RATED SPACE VEHICLE
Space vehicles for manned flight which have achieved the standards of performance and reliability previously established as reasonably acceptable for its class of equipment.

MANEUVER
See—bover and translation maneuver
midcourse maneuver

MANEUVERABILITY
That structural or aerodynamic quality in an air vehicle which determines the rate at which its attitude and direction of flight can be changed. Commonly expressed in G's or (gee load).

MANIFOLD
A pipe fitting with several lateral outlets or inlets for connecting one pipe with others.

MANNED SPACE FLIGHT SYSTEM
An instrument of space exploration consisting of a composite of equipment, skills, and techniques having a manned space vehicle as its major element.

MANNED SPACECRAFT CENTER MSC
This center is responsible for development and operation of the manned spacecraft and its associated ground support equipment. It is located at Houston, Texas. A portion of the center's staff and major facilities, such as a checkout hangar, altitude test tank, procedures trainer and Mercury Control Center, are located at Cape Canaveral, Florida.

MANOMETER
An instrument for measuring pressure of gases and vapors, both above and below atmospheric pressure.

MANUAL DOCKING
Manual control of the spacecraft during the docking maneuver.

MANUFACTURING PROCESS
The equipment, tooling and methods that the manufacturer intends to use in production.

MARGIN OF SAFETY
The percentage by which the criterion load or stress exceeds the design load or stress. E.g., criterion stress can mean the material yield stress, the material ultimate stress, etc.

MARGINAL TESTING
A procedure for system checking which indicates that some portion of the system has deteriorated to the point where there is a high probability of a resultant system failure during the next operating period.

MARINER
Program for deep space probe research of Venus and Mars.

MARS
Manned Astronautical Research Station.

MARSHALL SPACE FLIGHT CENTER MSFC
The Marshall Space Flight Center is charged with development of major launch vehicles to meet NASA's space mission requirements. Major projects conducted by Marshall are the Saturn Class, Centaur, and Nova. The Marshall Space Flight Center is located at Huntsville, Alabama.

MASER
Microwave amplification through stimulated electromagnetic radiation.

MASS
The measure of the amount of matter in a body, thus its inertia.
See—takeoff mass

MASS PROPERTIES
Physical properties which describe the mass characteristics of space vehicles and their systems, subsystems, and components. These properties include, but are not limited to weight, mass, center of gravity location, moments of inertia and products of inertia.

MASS PROPERTIES DETERMINATION EQUIPMENT
Equipment used to weigh a completely assembled dry stage of a space vehicle and to determine its longitudinal center of gravity. This equipment is also known as weight and balance kit.

MASS RATIO
The ratio of the mass of the propellant charge to the total mass of the total mass of the rocket charged with the propellant.
See—propellant mass ratio

MAST CONNECTION SYSTEM
Masts which provide support for the pneumatic, electrical, fuel, LOX, other service lines and umbilicals which connect to the first stage of and the launch vehicle. Links the launch vehicle to the ground system. The mast connection system is used only with the Saturn I block vehicles.

MASTER PLAN DRAWING
A drawing that shows sufficient features of an architectural topographical or construction site, so that it may be used as a guide in the long range development of the site.

MATCH LINES
The operating points where the inlet system air flow capacities and the jet engine air flow requirements are identical.

MATCHED PARTS DRAWING
Depicts special application parts which are machine matched or otherwise mated and for which replacement as a matched set or pair is essential.

MATERIAL SPECIFICATIONS
Used to establish the engineering requirements for the procurement, inspection, and test of purchasable materials.

MATERIAL PROCESS
Any procedure used in the production of any material which significantly modifies its properties.

MATHEMATICAL MODEL
All the mathematical statements which are required to describe a given process in all significant details under the influence of the full permissible range of variation of all the independent variables.

MATS
Military Air Transport Service.

MAXIMUM MATERIAL CONDITION
A condition wherein a feature of a finished part contains the maximum amount of material permitted by the toleranced size dimensions specified for that feature.

MAXIMUM RELIEF VALVE PRESSURE
The pressure at which the relief valve, or vent valve, is fully open.

MAXIMUM THRUST
The highest thrust recorded on the thrust-time trace.

MAXIMUM TOLERANCE
A specified allowance which, when added to a basic dimension, defines the largest acceptable dimension.

MCC
Mercury Control Center.
Mission Control Center.

MEAN CYCLES TO FAILURE
The total number of cycles divided by the number of failures (the reciprocal of the failure rate per cycle).

MEAN FREE PATH
The average distance that a particle travels between successive collisions with the other particles of an ensemble.

MEAN LIFE
The average time between random failures which cause the loss of at least one of the essential functions of the system or equipment.

MEAN TIME BETWEEN FAILURES **MTBF**
The total measured operating time of a population of equipments divided by the total number of failures.

MEAN TIME TO FAILURE
The measured operating time of an equipment divided by the total number of failures.

MEAN TIME TO FIRST FAILURE
The average time to the first failure based on several equipments.

MEAN TIME TO REPAIR
A parameter of the maintainability function and can be used as an index of maintainability in a manner analogous to the use of mean-time-between-failures (MTBF) as an index of reliability.

MEASURING SYSTEM
The system which converts any physical quantity, phenomenon, or action to proper form for recording or transmitting via telemetering link.

MECHANICAL BORDER
That layer in the atmosphere where air resistance and friction become negligible.

MECHANORECEPTOR
A nerve ending that reacts to mechanical stimuli as touch, tension, and acceleration.

MEDIUM PAYLOADS
Payloads on the order of 300 to 8,500 lbs.

MEMBER
Constituent part of any complete whole. An essential integral part of a unit.

MEMORY
The component of a computer, control system, guidance system, instrumented satellite, etc., designed to provide ready access to data or instructions previously recorded.

MERIDIAN
See—magnetic meridian

MESOSPHERE
In the nomenclature of Chapman, a stratum of atmosphere that lies between the stratosphere and the ionosphere, sometimes called the chemosphere. In the nomenclature of Wares, a stratum that extends approximately from 250 to 600 miles, lying between the ionosphere and the exosphere.

METAGALAXY
The entire system of galaxies.

METEOR
A transient celestial body that enters the Earth's atmosphere with great velocity, incandescent with heat generated by the resistance of the air.

METEOR SAFE WALL
A protective blanket of atmosphere through which meteors rarely penetrate. Meteors are burned up and vaporized in this area due to friction with air molecules.

METEORIC
Of or pertaining to meteors, or meteoroids.

METEORITE
A meteoroid which has reached the surface of the Earth without being completely vaporized.

METEOROID
A small solid body traveling through outer space. When a meteoroid enters the Earth's atmosphere it becomes a meteor.

METHOD
See—brute force method
freeze-out method
relaxation method

METHOD OF ATTRIBUTES
Measurement of quality determined by noting the presence or absence of some characteristic in each of the units in the group.

MHD
Magnetohydrodynamics.

MICHOUD PLANT
A manufacturing activity, under the direction of Marshall Space Flight Center, responsible for the manufacture of boosters and other large stages for use on the manned lunar landing program. Plant operation is conducted by companies under contract with NASA.

MICROMETEOROID
Meteoroids less than 1/250th of an inch in diameter.

MICROMETEORITE
A very small meteorite or meteoritic particle with a diameter less than a millimeter.

MIDCOURSE
For lunar and planetary missions, this is the period between escape from the originating point and before commitment to entry or orbit at the destination.

MIDCOURSE MANEUVER
Changes introduced in the spacecraft flight path during the midcourse period to maintain the desired trajectory.

MIDCOURSE MEASUREMENT
Measurements made by taking visual sightings of Earth, Moon, and Stars to determine vehicle position.

MIDCOURSE MEASUREMENT CORRECTION MMC
The navigation and velocity corrections which are the principal operations during the coasting phases in cislunar space.

MIDCOURSE MODE
The mode of operating the Apollo guidance and navigation equipment (AGE) during the translunar and transearth phase of the flight. Visual sightings are made of the Earth, Moon, and Stars to provide the primary navigation information.

MILA
Merritt Island Launch Area.

MILESTONE
Significant point within the research, development, test, evaluation, production, and in-service life of a system, equipment, or effort. Milestone possesses a distinct objectively identifiable terminal point which can be used as a means of evaluating progress in terms of an estimated time schedule.

MILK STOOL
The physical arrangement of the three storable propellant rocket engines located below the main pressure vessel of the lunar excursion module.

MINIATURIZE
To construct a functioning minature of a part or instrument where room is at a premium, also minaturized.

MINIMUM ACCEPTABILITY
Level of effective reliability that must be demonstrated at the close of the research and development phase of a program.

MINIMUM ACCEPTABLE RELIABILITY
Reliability which must be achieved before approval of the first articles with operational configuration.

MINIMUM MATERIAL LIMIT
The minimum limit of size of an internal dimension.

MINIMUM MATERIAL SIZE
The limit at which a part contains the minimum amount of material. The minimum external limit and the maximum internal limit.

MINIMUM TOLERANCE
A specified allowance which, when subtracted from a basic dimension, defines the smallest acceptable dimension.

MINITRACK
The tracking network originally established for Vanguard tracking and data acquisition during the international geophysical year (1959-60). Now the basic network for tracking small scientific Earth satellites.

MINITRACK RADIO
A radio receiving set that tracks an object equipped with a miniature transmitter emitting telemeter-type signals. Used in tracking Earth satellites.

MINOR ASSEMBLY
A combination of detail parts and subassemblies issued as an element of an installation. It performs a minor function necessary to the operation of the installation and is constructionally relatively simple.

MINOR DEFECT
A defect that does not materially reduce the usability of the unit of product for its intended purpose, or is a departure from established standards having no significant bearing on the effective use or operation of the unit.

MISSILRY
The art or science of designing, developing, building, launching, directing, and sometimes guiding a missile.

MISSION
The objective, task, or purpose which clearly indicates the action to be taken.
See—alternate mission
flight mission

MISSION ANALYSIS
A comprehensive evaluation of all the parameters which affect the events of a mission.

MISSION AVAILABILITY
The expected availability for a given mission period. Derived from the general model by computing the average value of time for the mission period.

MISSION CONTROL CENTER **MCC**
Centralized over-all control point for all phases of the flight mission.

MISSION OPERATIONS CONTROL ROOM **MOCR**
The MOCR contains a group of specialized functional locations (called stations) where specific information will be available that contributes directly to the decision of the Operations Directorate to continue, modify or abort the mission.

MISSION PROFILE
A graphic or tabular presentation of the flight plan of a spacecraft showing all pertinent events scheduled to occur.

MISSION RELIABILITY
The product of readiness, functional and flight reliability.

MISSION SUCCESS
The attainment of all or a major part of the scientific objectives of the flight with no crew injury or loss of life. It has sometimes been alternately defined as the safe return of all three astronauts from a completed lunar landing mission.

MISSION SUITABILITY
The ability of the manned space flight system to perform the mission for which it was primarily designed.

MISSION TASK
The specified purpose for which a device must perform.

MISSION VERSATILITY
The ability of the manned space flight system to perform missions other than those for which it was primarily designed.

MISSISSIPPI TEST FACILITY **MTF**
NASA will use this facility for the static test site for Saturn and Nova-class launch vehicles. The site is located in southwest Mississippi, approximately fifty miles east of New Orleans, Louisiana.

MLLP
Manned Lunar Landing Program.

MMC
Midcourse Measurement Correction.

MOCR
Mission Operations Control Room.

MOCK-UP
A full-sized replica or dummy.

MOCK-UP INSPECTION
An inspection of a mock-up to determine the operational suitability of the configuration and general arrangement of the operational article represented.

MOD
Modification.

MODE
(1) In statistics, the value or number in any large grouping, which appears most frequently.
(2) In structural dynamics, the characteristic shape taken by a beam or structure when vibrated at a resonant frequency (usually the first 3 or 4 bending modes are the most important).
(3) A descriptive term applied to a particular methodology or sequence of performing one task of several possible tasks.
See—abort mode
close aboard mode
midcourse mode

MODEL
See—development model
engineering model
experimental model
life-test model
production model
proof-test model

MODIFICATION **MOD**
Any alteration that changes capabilities or characteristics of equipments.

MODIFICATION KIT
An item composed of a group of articles which is issued as a unit for accomplishing an alteration to an equipment.

MODIFIED DRAWING
Made for commercial and patented articles that are altered or selected for special fits, tolerances, and performance.

MODULAR TECHNIQUES
Techniques which encourage multiple usage or buildup of assemblies or subassemblies by standardizing configuration and functional characteristics.

MODULE
A combination of components, contained in one package or common to one mounting, which provide a complete function to subsystems and systems in which they operate.
See—command and service module
lunar excursion module
service module

MOISTURE-RESISTANT MATERIAL
A material which will not absorb moisture when subjected to conditions of high humidity for extended periods of time.

MOLECULE
An aggregate of two or more atoms of a substance that exists as a unit.

MOMENTS
In statistics, the mean value of a power of a variate. A moment about a particular fixed value, such as the mean, is the mean value of a power of the deviations of the variates from that fixed value.
See—binge moment

MONITOR PANEL
Panel for indicating operating conditions of a component or system but with no means of control.

MONO-DETAIL DRAWING
A one item drawing.

MONOCHROMATIC EMISSIVE POWER
Emissive power emitted at a single wavelength for a given temperature.

MONOCHROMATIC EMITTANCE
Emittance radiating at a particular wavelength.

MONOPROPELLANT
A rocket propellant in which the fuel and oxidizer are premixed ready for immediate use.

MOOSE
Man Out Of Space Easiest (emergency space escape system).

MORTALITY
See—infant mortality

MOTION
See—dislocation motion
first motion
posigrade motion
retrograde motion

MOTOR SKILL
The ability to achieve adjustments of parts of the body in an integrated smoothly flowing sequence, resulting in the performance of some act.

MOVING INSPECTION LOT
A collection of units of product offered for inspection during a fixed period of time. All of the units of product are presented to the inspector in the period during which the sample is being drawn.

MSC
Manned Spacecraft Center (NASA, Houston, Texas).

MSFC
Marshall Space Flight Center.

MSL
Mean Sea Level.

MTBF
Mean Time Between Failures.

MTF
Mississippi Test Facility.

MULTI-DETAIL DRAWING
A several item drawing.

MULTIPLE AIR BAG LOAD ALLEVIATOR
An arrangement of gas-filled bags which are attached to the vehicle. The bags collapse on impact, thus alleviating the load.

MULTIPLE SAMPLING
Sampling inspection in which, after each sample the decision may be to accept, to reject, or to take another sample. Usually a prescribed maximum number is provided. After this number of samples has been taken a decision to accept or reject must be reached. Note, multiple sampling as defined here is sometimes called sequential sampling or group sequential sampling. The term multiple sample is preferred.

MULTIPLE SAMPLING PLAN
Under a multiple sampling plan, results of the inspection of one or more successive samples from an inspection lot may be required to determine its acceptability. A multiple sampling plan consists of three or more sample sizes with associated acceptance and rejection criteria.

MULTIPLE-LEGEND INDICATOR LIGHTS
A display which contains two or more legend plates.

MULTIPLE-MODE GUIDANCE SYSTEM
A system utilizing more than one method of scanning to determine position to generate direction changes to arrive at a desired position.

MULTIPLEXER
A mechanical or electrical device for sharing of a circuit by two or more coincident signals.

MULTIPLEXING
The simultaneous transmission of two or more signals within a single channel.

MULTIPROPELLANT
A rocket propellant consisting of two or more substances fed separately to the combustion chamber.

MULTISTAGE IGNITION
An ignition system in a ramjet in which a portion of the fuel is ignited and these products are used to ignite the remainder of the mixture.

MULTISTAGE ROCKET
One in back of it has exhausted its propellant. Normally, each unit or stage is jettisoned after completing its firing. Also called a multiple-stage rocket.

N

NAMTC
Naval Air Missile Test Center (Point Mugu).

NASA
National Aeronautics and Space Administration.

NASC
National Aeronautics and Space Council.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION **NASA**
Civilian agency with research and development jurisdiction in aeronautical and space activities, except those activities peculiar to and primarily associated with the development of weapons systems and military operations.

NATIONAL AERONAUTICS AND SPACE COUNCIL **NASC**
Statutory Advisory Council to the President, consisting of Secretary of Defense, Administrator of NASA, Chairman of AEC, Secretary of State, and other members selected by the President.

NATURAL ENVIRONMENT
The state or conditions which would exist in the absence of the test subject.

NAUTICAL MILE **NM**
A measure of distance equal to 6,076.103 ft. or approximately 1.15 miles.

NAVIGATOR
The second member of the Apollo flight crew. The navigator's primary responsibilities are the operation and maintenance of guidance and navigation equipment. He occupies the center couch during launch and reentry, and provides back-up for the commander in monitoring key systems performance during critical mission phases.

NAVIGATION
The science of guiding ships, aircraft, etc. through the use of calculations as to position and direction etc. involving geometrical calculations, reference to celestial bodies, reference to landmarks, radio aids, etc.
See—celestial navigation

NEBULA
Any celestial structure outside the solar system that occupies a perceptible extent in the sky and is not resolvable into stars by a large telescope.

NEGATIVE G
Eyeballs up. The acceleration stress that a subject experiences as acting from below (feet to head direction).

NERV
Nuclear Emulsion Recovery Vehicle (to obtain data on Van Allen belt).

NERVA
Nuclear Engine For Rocket Vehicle Application.

NET POSITIVE SUCTION HEAD **NPSH**
A parameter used in liquid rocket engines to describe the effective inlet pressure conditions to the propellant pumps. The pressure head available at the pump suction flange is provided by tank pressure head, elevation, and acceleration forces (and is reduced by line friction and vapor pressure). NPSH is the head available to prevent pump cavitation.

NEUTRON
A subatomic particle with no electric charge having a mass slightly more than the mass of the proton.

NEWTON'S LAWS OF MOTION
A set of three fundamental postulates forming the basis of the mechanics of rigid bodies, formulated by Newton in 1687.

NM
Nautical Mile.

NOCTILLUCENT CLOUD
High-altitude cloud lying at an altitude of 50 miles, appearing only after sunset or before sunrise when contrasted against a dark sky. May consist of volcanic dust or interplanetary matter trapped by temperature incersion.

NOISE
Any unwanted disturbance or sound within a useful frequency band, such as undesired electric waves in a transmission channel or device. When caused by natural electrical discharges in the atmosphere, noise may be called static.
See—acoustical noise
electronic noise interference
solar noise
white noise

NOMINAL SIZE
A dimension of length, diameter, etc. often used to designate a standard or commercial size which approximates the actual size.

NOMINAL STRESS LIMITS
The limits within which the crew's environment shall be maintained during normal operations.

NON-STANDARD PART
One for which no published standard or specification exists.

NONDEPENDENT ASSEMBLY OR UNIT OF EQUIPMENT
Not dependent upon any other part of the design item in order to perform its intended function.

NON-DESTRUCTIVE TESTING
Testing of a nature which does not impair the usability of the item.

NONSTRESSED LIMITS
The environmental limits to which the crew may be subjected for extended periods of time such as orbit, lunar transit, etc.

NORMAL DISTRIBUTION
The fundamental frequency distribution of statistical analysis. The principal characteristics of the normal law are—

(1) It is symmetrical. Negative and positive deviations of equal magnitude are equally likely to occur.

(2) It is a continuous function rather than a discrete function. It assigns a definite probability to every deviation. There are no excluded cases.

(3) There is just one most probable result, and this is identical with the first expectation of the variable.

NORMAL INSPECTION
Inspection which is used when there is no significant evidence that the quality of product being submitted is better than or poorer than specified requirements.

NORMAL OPERATING PERIOD
That period of equipment life during which the equipment failure rate remains essentially constant.

NORMAL SHOCK WAVE
A shock wave perpendicular to the direction of flow in a supersonic flow field. Sometimes shortened to normal shock.

NOSECONE
The cone-shaped leading end of a rocket vehicle consisting of a chamber or chambers in which a satellite, instruments, animals, plants, or auxiliary equipment may be carried, or of an outer surface built to withstand high temperatures generated by aerodynamic heating.

NOTATION
See—binary notation

NOTS
Naval Ordnance Test Station (China Lake, Calif.).

NOVA
Post-Saturn launch vehicle for space missions of 1970 and beyond.

NOZZLE
The part of a rocket thrust chamber assembly in which the gases produced in the chamber are accelerated to high velocities.
See—exhaust nozzle

NPG
Naval Proving Grounds (Dahlgren, Va.).

NPSH
Net positive suction head.

NRDS
Nuclear Rocket Development Station.

NRX
The designation of the experimental reactors for the Nerva engine system.

NSA
National Security Agency.

NUCLEAR FUEL
Fissionable material of reasonably long life, used or usable in producing energy in a nuclear reactor.

NUCLEAR RADIATION
The emission of neutrons and other particles from an atomic nucleus as supporting chain reaction.

NUCLEAR REACTOR
An apparatus in which nuclear fission may be sustained in a self-supporting chain reaction. Commonly called reactor.

NUCLEAR ROCKET
Rocket in which the energy for the exhaust stream is derived from nuclear fission or fusion.

NUCLEAR ROCKET DEVELOPMENT STATION NRDS
NASA-AEC facility concerned with performing research and development work on nuclear powered rocket engines, such as the Kiwi series to be used for upper-stage space flight propulsion. The test site is located at Jackass Flats, approximately 60 miles northeast of Las Vegas, Nevada.

NUCLEUS
The positively charged core of an atom.

NULL CIRCLE
Theoretical point in space where the gravitational attraction of one planet balances that of another.

NULL HYPOTHESIS
An assumed proposition used for the purpose of statistical test.

O

O&C BLDG
Operations and Control Building.

OAO
Orbiting Astronomical Observatory.

OASM
Office of Aerospace Medicine (NASA/OMSF).

OC
Operating characteristic.

OCCULATION
The disappearance of a body behind another body of larger apparent size.

OCTAVE
An interval between two frequencies having a ratio of 2 to 1. Also, any group of eight is an octave of elements.

OCULOGRAVIC ILLUSION
A mixed sensory illusion of flight involving the eyes and propriceptors (nerve-endings which receive stimuli from within one's own body).

OCULOGYRAL ILLUSION
A mixed sensory illusion of flight involving the eyes and the semicircular canals of the ear, e.g., graveyard spin, Corioles reaction, and rotation illusion.

OFF LIMIT TEST
Test at stress levels higher than design level, conducted for the purpose of determining a safety factor or margin.

OFFICIAL DRAWING
Any drawing which bears a title, a drawing number, and the dated signature of the maker and the issue date.

OG
Outer Gimbal.

OGA
Outer Gimbal Axis.

OGO
Orbiting Geophysical Observatory (series of geophysical research satellites, includes EGO and POGO).

OICO
Office of Integration and Checkout (NASA/OMSF).

OLO
Orbital Launch Operation.

OLVP
Office of Launch Vehicles and Propulsion (NASA/OMSF).

OMNI-ANTENNA
An antenna having an essentially non-directional pattern in azimuth and a directional pattern in elevation.

OMSF
Office of Manned Space Flight (NASA).

ON-LINE COMPUTING
Computation made without significant delay, and in so close a relation to the source of input data as to make possible the immediate and direct use of results for process control and other simultaneous monitoring purposes.

ONE HUNDRED PERCENT INSPECTION
Inspection of every unit of product. Each unit of product is accepted or rejected individually for the characteristic concerned.

ONR
Office of Naval Research.

OPERATING CYCLE
A complete sequence of operations required for normal functions of an item of equipment, or for limited test purposes.

OPERATING PRESSURE
The nominal pressure to which the components are subjected under steady state conditions in service operations.

OPERATING TIME
The time period between turn-on and turn-off of a system, subsystem, component or part during which time operation is as specified. Total operating time is the summation of all operating timer periods.

OPERATION
See—automatic operation
bleed-cycle operation

OPERATIONAL
Equipment for which all research and development has been completed with achievement of performance objectives.

OPERATIONAL CYCLE
The required life of the equipment including all end-item test time, transportation and handling where appropriate, all check-out time prior to flight in addition to the actual flight mission phase.

OPERATIONAL FLIGHT CONTROL
The spacecraft in-flight control after launch. This is accomplished by adaptive control before launch vehicle separation and by the onboard crew after launch vehicle separation.

OPERATIONAL GROUND EQUIPMENT
A functional part of a system which operates with the aerospace vehicle or end item as an essential operating element thereof.

See—aerospace ground equipment

OPERATIONAL LAUNCH VEHICLE
Launch vehicles employed after R and D has been completed, man rating achieved, and a predetermined number of complete operational missions performed.

OPERATIONAL PHASE
The period from acceptance by the user of the first operating unit until disposition of the system equipment. The operational phase overlaps the acquisition phase.

OPERATIONAL READINESS
The probability that a system or equipment when used under stated conditions and in an actual supply environment will operate satisfactorily during any given period of time. Sometimes defined as operational availability.

OPERATIONAL SPACE VEHICLE
Space vehicles which meet the requirements specified separately for the operational launch vehicle and the operational spacecraft.

OPERATIONAL SPACECRAFT
Spacecraft employed after all R and D has been completed, man rating achieved and a predetermined number of complete operational missions performed.

OPERATIONS DIRECTORATE STATION
A station in the Mission Operations Control Room which directs overall mission conduct from prelaunch through recovery.

OPRM
Office of Program Review and Resources Management (NASA/OMSF).

ORB
A spherical body, especially a celestial sphere, a planet, or a man-made satellite of that shape.

ORBIT
The path in which one body revolves about another under the gravitational attraction of the latter, as a planet or comet around the Sun, or a satellite around a planet.

See—circular orbit
Earth orbit rendezvous
eccentric orbit
equatorial orbit
equi-period transfer orbit
geostationary orbit
hohmann orbit
low Earth orbit
lunar orbit rendezvous
parking orbit
polar orbit
stationary orbit
synchronous orbit
transfer orbit

ORBIT NODES
Points in an orbit where the orbit crosses a reference plane, such as the ecliptic or the equatorial plane.

ORBITAL BOMBER
A vehicle with the capability of orbiting speeds to allow circling the Earth one or more times at very high altitudes and then gliding home to Earth.

ORBITAL ELEMENTS
A set of 7 parameters defining the orbit of a satellite.

ORBITAL LAUNCH OPERATION **OLO**
A concept involving the techniques of rendezvous, docking, assembly in orbit, launch from orbit, in-space maintenance, repair refueling, and permanently orbiting space station.

ORBITAL PERIOD
The period of time taken by an orbiting body to make a complete orbit.

ORBITAL VELOCITY
Velocity required to establish and maintain a satellite in orbit. The term refers to average velocity, since the velocity is greater at the perigee than at the apogee.

ORBITING ASTRONOMICAL OBSERVATORY **OAO**
A series of scientific satellites to obtain precision telescopic observation of emission and absorption characteristics of the Sun, stars, planets, and nebulae in the ultraviolet, infrared, and X-ray regions of the electromagnetic spectrum.

ORBITING SOLAR OBSERVATORY **OSO**
A solar-stabilized scientific satellite carrying solar-oriented experiments, comparing radiation from the sun to that in other portions of the sky. First launch was in 1962.

ORDNANCE INSTALLATIONS
Those components of ordnance systems which are hazardous components, including squibbs, explosive devices, hypergolic igniters, and solid propellant motors.

ORDNANCE TOWER
A specific structure employed in the Apollo program at the launch facility. The ordnance items are installed, checked out, and connected in a relatively remote area and under closely controlled safety and test conditions.

ORIFICE
A fixed restriction in a fluid passage which establishes the rate of fluid flow. It usually consists of a thin circular diaphragm with an accurately machined concentric hole.

ORGANIZATIONAL MAINTENANCE
That maintenance authorized for, performed by, and the responsibility of a using organization on its own equipment.

ORIENTATION CONTROL
The control of the direction of the axes of a vehicle, the pointing of vehicle or parts thereof toward a desired point.

OSFM
Office of Spacecraft and Flight Missions (NASA/OMSF).

OSO
Orbiting Solar Observatory.

OTOLITH
A small calcareous concretion located in the inner ear which plays a part in the mechanism of orientation.

OUTER GIMBAL AXIS **OGA**
The axis about which the inertial measurement unit's (IMU's) outer gimbal rotates.

OUTGASSING
The evolution of gas from a solid in a vacuum.

OXIDIZER
A substance that supports the combustion reaction of a fuel or propellant.

OXYGEN
See—liquid oxygen
liquid oxygen (LOX) system complex

OXYGEN-HYDROCARBON ENGINE
A rocket engine that operates on propellant of liquid oxygen as oxidizer and a hydro-carbon fuel, such as the propellant derivatives.

OZONOSPHERE
A stratum in the upper atmosphere having a relatively high concentration of ozone, important for absorption of ultraviolet solar radiation.

P

PACE/LV
Pre-flight Acceptance Checkout Equipment-Launch Vehicle.

PACE/SC
Pre-Flight Acceptance Checkout Equipment-Spacecraft.

PACIFIC MISSILE RANGE **PMR**
A national instrumented missile test range with down range tracking facilities, located on the west coast of the United States at Point Arguello, California.

PAD
See—fuel pad
launch pad

PAD ABORT
Stopping the mission of a space vehicle still on the launch pad because of malfunction, change in plans, or other problems.

PAD TERMINAL CONNECTION ROOM **PTCR**
A room that will be located in the launcher area of complex 39 launch pad and will contain equipment to connect the launch control center with the launch/umbilical tower, as well as all the electrical equipment necessary to operate, checkout and monitor all environmental control system equipment, propellant and high pressure gas storage facilities.

PANEL
The front plate of an assembly upon which operational controls and indicating devices are normally mounted.
See—monitor panel
patch panels

PANIC BARS
Levers or control actuating devices which are easily accessible and operable in the event of an emergency.

PARABOLA
A conic section made by an intersecting plane parallel to the side of the cone.

PARABOLIC REENTRY
Reentry at speeds of less than 36,500 feet per second.

PARACHUTE
See—drogue parachute

PARAGLIDER
An inflatable device, combining attributes of both the parachute and the winged glider, being evaluated for use in the Gemini and Apollo landing systems.

PARALLAX
The apparent displacement of an object, or the apparent difference in its direction of motion, if viewed from two different points.

PARALLEL OPERATION OF ENGINES
The operation of two or more engines in a system to provide more thrust than from a single engine without having thrust misalignment or interference of one engine with another. This refers chiefly to electric engines.

PARAMETER
One edge of the frame of reference. A term indicating the limits of the goals, or a factor arbitrarily fixed to define the goals which must be met in order that a mission succeed.
See—maintainability parameters
physiological parameters

PARKING ORBIT
An intermediate orbit around a celestial body where the spacecraft can await development of trajectory conditions required for the next phase of the mission.

PARSEC
Astronomical unit of distance equal to 19,150,000,000,000 miles, indicating the distance at which the mean radius of Earth's orbit would subtend an angle of one second of arc.

PART **PT**
One piece, or two or more pieces joined together, which are not normally subject to disassembly without destruction of design use.
See—approved part
detail part
non-standard part
qualified part
standard part

PART FAILURE
A failure which usually involves a non-repairable breakdown and immediate end of life for a part which is subsequently permanently replaced.

PART FAILURE RATE
That rate at which a part fails to perform its intended function.

PARTICLE
See—energetic particle
subatomic particle

PARTS LIST
A list of parts or items for a product, unit, equipment, or any portion thereof.

PASSIVE CIRCUIT
A circuit which has no components capable of power gain.

PASSIVE SATELLITE
A communication satellite that simply reflects radio energy transmitted from one ground terminal to another without amplification or retransmission. A radio mirror.

PATCH PANELS
An electrical panel or board used for inter-connecting instrumentation and control circuits to provide for multiple use of instrumentation and circuitry, plus flexibility in its application.

PATHFINDER
An instrument installed in a spacecraft used for navigating or homing.

PAYLOAD
That which an aircraft, rocket, or the like carries over and above what is necessary for the operation of the vehicle during its flight.
See—medium payloads

PCM
Pulse Code Modulation.

PDA
Pump Drive Assembly.

PDM
Pulse Duration Modulation.

PENDULUM
See—pulsed integrating pendulum
pulsed integrating pendulum accelerometer

PEP
Physiological Evaluation of Primates (primate orbital study program).
Princeton Experimental Package (telescope and spectrometer package for orbiting astronomical observatory (OAO).

PERCENTAGE DEFECTIVE
That proportion of a lot which is defective. This is the figure of merit in the population domain which characterizes quality control measurements and differentiates it from reliability.

PERCENTILE
A point score assigned to any given raw score in a distribution to indicate the percent of measures in the whole distribution which fall below the given score. Percentile rank or percentile score.

PERCENTILE RANGE
The interval between two given percentiles.

PERFORMANCE CAPABILITY
The functional ability of the equipment in terms of engineering specifications (accuracy, range, speed, capacity, etc.). Performance requirements serve to tie operational availability to the mission and may vary or be fixed for different or all mission.

PERI
A prefix meaning near.

PERICYNTHION
The point in an elliptical orbit about the Moon at which an orbiting vehicle is closest to the Moon.

PERIGEE
That orbital point nearest the Earth when the Earth is the center of attraction.

PERIHELION
That point on an elliptical orbit around the Sun which is nearest to the Sun.

PERIOD
See—anomalistic period
early failure period
normal operating period
orbital period

PERISELENE
Lowest point in a lunar orbit.

PERMANENTLY FASTENED ASSEMBLY DRAWING
Depicts two or more parts that are permanently fastened together by welding, brazing, riveting, etc., so as to form a unit which is removable from a higher level assembly but cannot be readily disassembled.

PERT
Program Evaluation and Review Technique.

PERTURBATION
Effect of the gravitational attraction of one body on the orbit of another.

PFRT
Preliminary Flight Rating Test.

PHASE
See—conceptual phase
operational phase

PHOEBUS REACTOR
A conceptual reactor design with a higher power-to-weight ratio than kiwi.

PHONOCARDIOGRAM
The measurement and recording of the audible heart beat.

PHOTOMETRY
The measurement of the intensity of light.

PHOTON ENGINE
A projected type of reaction engine in which thrust would be obtained from a stream of electro-magnetic radiation.

PHOTOSPHERE
The outermost luminous layer of the Sun's gaseous body.

PHOTOSYNTHETIC GAS EXCHANGER
A device which utilizes plants and light energy to convert back into oxygen the carbon dioxide generated by man or animals through breathing oxygen.

PHYSICAL ENVIRONMENT
Those conditions usually caused by nature.

PHYSICAL-CHEMICAL SYSTEM
A system for removing contaminants from the cabin atmosphere and supplying a breathable atmosphere by means of chemical and mechanical techniques.

PHYSICS
See—fission fragment physics

PHYSIOLOGICAL ACCELERATION
The acceleration experienced by a human or an animal test subject in an accelerating vehicle.

PHYSIOLOGICAL FACTORS
Factors which effect a crew's health and ability to function.

PHYSIOLOGICAL PARAMETERS
Arbitrary mathematical expressions of the functions of living organisms and their parts.

PICKET SHIP
One of the ocean-going ships used on a missile range to provide added instrumentation for tracking or recovering the missiles.

PICKOFF
A sensing device that responds to angular movement to create a signal or to effect some type of control.

PICKUP
A device that converts a sound, view, or other form of intelligence into corresponding electric signals.

PIGGY BACK EXPERIMENT
An experiment which rides along with the primary experiment on a space-available basis, without interfering with the mission of the primary experiment.

PILGRIM
Lunar colonization project.

PILOT PRODUCTION OR PILOT MODEL
The initial post-tooling production of a model to prove the capability of the tooling and production line.

PIONEER
Series of space probes.

PIP
Signal indication on the scope of an electronic instrument, produced by a short sharply pecked pulse of voltage. Also called blip.
Pulsed Integrating Pendulum.

PIP DUCOSYN EXCITATION
Voltage applied to the ducosyns to provide magnetic suspension.

PIP SIGNAL GENERATOR EXCITATION
The reference voltage for the signal generator.

PIPA
Pulsed Integrating Pendulum Accelerometer.

PIRD
Program Instrumentation Requirements Document.

PITCH
The movement about an axis that is perpendicular to the vehicle's longitudinal axis and horizontal with respect to a primary body.

PITCHOVER
The programed turn from the vertical that a rocket takes as it describes an arc and points in a direction other than vertical.

PLAGES
Clouds of calcium or hydrogen vapor that show up as bright patches on the visible surface of the sun.

PLAN
See—sampling plan

PLAN DRAWING
This drawing indicates materials of construction, shows arrangement of structural framing, floor or desk spaces, the location of equipment or furniture as appropriate. Also may depict individual layouts for heating, plumbing, air conditioning, electrical, or other utility systems.
See—master plan drawing
plot plan drawing
vicinity plan drawing

PLANET
A celestial body of the solar system revolving around the sun in a nearly circular orbit, or a similar body revolving around a star.

PLANETOID
One of the numerous small planets nearly all of whose orbits lie between Mars and Jupiter. Also called asteroid and minor planet.

PLANETOLOGY
The study of planets and satellites.

PLASMA
An electrically conductive gas comprised of neutral particles, ionized particles, and free electrons. As a whole, electrically neutral.

PLASMA ENGINE
A reaction engine using magnetically accelerated plasma as a propellant.

PLASMA JET
A magnetohydrodynamic rocket engine in which the ejection of plasma generates thrust.

PLASMA SHEATH
An envelope of ionized gas that surrounds a body moving through an atmosphere at hypersonic velocities.
See–ionized plasma sheath

PLASTIC BEHAVIOR
Ability of a material to flow under stress, and the yielding under stress without brittle fracture.

PLOT PLAN DRAWING
Represents areas on which structures are clearly indicated with detailed information regarding their relationship to other structures, to existing and proposed utilities, topography, boundary lines, roads, walks, fences, etc.

PLPS
Propellant Loading & Pressurization System.

PLS
Propellant Loading System.

PLUM BROOK RESEARCH STATION
This station conducts research pertinent to nuclear rocket systems, chemical rockets, and power generation systems. It is operated by the Lewis Research Center located at Sandusky, Ohio.

PMR
Pacific Missile Range.

PNEUMATIC CONTROL SYSTEM
A system of equipments and facilities which supplies gaseous nitrogen and helium from the high pressure GN-2 and helium storage facility.

POD
Pre-flight Operations Division–(Cape Canaveral).

POGO
Polar Orbiting Geophysical Observatory.

POINT
See–exposed test point
saddle point
stationary point
test point

POLAR ORBIT
The orbit of an Earth satellite that passes over or near the Earth's poles.

POLAR ORBITING GEOPHYSICAL OBSERVATORY **POGO**
A scientific satellite to be launched into a polar orbit to obtain information on the properties of the upper atmosphere and ionosphere with special emphasis on the polar regions.

POLARIZATION
A state of electromagnetic radiation in which transverse vibrations take place in some regular manner, e.g., all in one plane, in a circle, in an ellipse, or in some other definite curve.

POND
See–burn pond
deluge collection pond
holding pond

POPULATION
The total collection of units from a common source. The conceptual total collection of units from a process, such as a production process. Also used in the sense of a universal (or population) of observation.

POSIGRADE MOTION
Orbital motion in the same direction as that normal to spatial bodies in a given system or in the same direction as a reference direction.

POSIGRADE ROCKET
A small vernier rocket on a spacecraft used to control its attitude during space flight, the thrust of which is in the same direction as the movement of the spacecraft.

POSITIVE G
Eyeballs down. Acceleration experienced in the downward (head-to-feet) direction, expressed in units of gravity.

POST-FLIGHT
The phase of space vehicle operations beginning with the landing of the command module upon the earth and ending when the final flight test report is completed.

POST-LAUNCH
The period following separation of hard ground connections from the space vehicle at launch.

POST-STATIC TEST
System or subsystem tests to detect possible damage or conditions incurred during static test, plus test of additional components or systems not used during the test. E.g., only vehicle booster is static tested, then upper stages are checked with booster.

POUND FORCE
The force equal to the weight of a standard pound mass under conditions of standard gravitational acceleration. The basic engineering unit of force.

POUND THRUST
A measurement unit of the reaction force generated in a jet or rocket engine and available for propulsion.

POWER LANDING
The landing of a spacecraft on a body in space in which the thrust of its motors is used as a brake.

PPM TELEMETRY
In pulse position modulation telemetry the information transmitted is contained in the presence or absence of a pulse within a known block of pulses.

PRE-FIRING GROUND PRESSURIZATION EQUIPMENT
Equipment used to provide pressurization of stage propellant tanks prior to static firing and launch.

PRE-STATIC TEST
System or subsystem tests to insure proper operation of a vehicle which is to be static fired.

PRECAUTIONARY MAINTENANCE
A procedure of reconditioning a product before failure in order to prevent failures in service.

PRECESSION
The change in the direction of the axis of rotation of a spinning body or of the plane of the orbit of an orbiting body when acted upon by an outside force.

PRECESSION OF THE EQUINOXES
The concial motion of the Earth's axis about the vertical to the plane of the ecliptic, caused by the attractive force of the Sun, Moon, and other planets of the equatorial protuberance of the Earth.

PREDICTIVE TEST
A test employing non-destructive measurement techniques to identify units which will exhibit submarginal performance in service.

PRELAUNCH
The phase of operations, beginning with the arrival of space vehicle elements at the launch site, and ending with the start of the launch countdown.

PRELAUNCH TEST
Test of missile and ground equipment to determine readiness to launch. May include a countdown and a flight readiness firing with all launch complex equipment operating, but not including actual launching of the vehicle.

PREPRODUCTION TEST
Test performed on first production equipment using factory tooling and methods to insure that processes and methods are capable of producing satisfactory product.

PREPROTOTYPE HARDWARE
Hardware built for the purpose of development testing prior to the manufacture of prototype or qualification hardware.

PRESSURE
See—design burst pressure
dynamic pressure
limit pressure
maximum relief valve pressure
operating pressure
working pressure

PRESSURE SUIT
A garment designed to provide the human body an environment above ambient pressure so that respiratory and circulatory functions may continue normally, or nearly so, under low-pressure conditions that occur at high altitudes or in space without benefit of a pressurized cabin.

PRESSURIZED CABIN
A cabin in an aircraft or spacecraft designed to provide an adequate internal air pressure to permit normal respiratory and circulatory functions.

PREVALVE
A valve in the stage propellant feed systems which is used to keep the propellants from free-flowing out of the stage propellant tanks into engine propellant feed system.

PREVENTIVE MAINTENANCE
The systematic care, servicing, and inspection of equipment for the purpose of maintaining it in servicable condition and detecting and correcting incipient failure.

PRIMARY BODY
The spatial body about which a satellite or other body orbits, or from which it is escaping, or towards which it is falling.

PRIMARY COSMIC RAYS
High-energy particles originating outside the earth's atmosphere.

PRIME CONTRACTOR
A contractor with total system responsibility for the execution of work on contract to a government agency. This includes all functional and administrative responsibilities necessary to satisfy contract requirements. Major programs can be established with separate prime contractors for essentially independent systems, but each will perform as a contractual entity with respect to the contracting agency.

PRIME FOCUS FEED
A feed located at the focal point of a reflecting parabola. In contrast, cassegrain feed is located away from the focal point.

PRINCIPAL CONTRACTOR
A term developed for application to the Apollo spacecraft contract. The principal contractor has responsibility for a defined system with specific (sub) system exclusions. The principal contractor retains functional responsibility for technical integration but has no responsibility for administrative or contractual matters of the excluded (sub) system these latter are retained by the contracting agency.

PROBABILITY
The ratio of chances favoring an event to the total number of possibilities for and against it.

PROBABILITY LIMITS
Upper and lower limits assigned to estimated value to indicate the range within which the true value is supposed to lie according to some statement of a probabilistic character.

PROBABILITY OF ACCEPTANCE
Probability that a lot or process will be accepted.

PROBABILITY OF SURVIVAL
A numerical expression of reliability indicating the probability of an equipment, showing a given period of operating time without a failure.

PROBE
Any device inserted in an environment for the purpose of obtaining information about the environment. Specifically an instrumented vehicle moving through the upper atmosphere or space, or landing upon another celestial body in order to obtain information about the specific environment.
See—interplanetary monitoring probe
space probe

PROCEDURES
A particular course or mode of action for conducting a business or the formal instructions carrying management approval, governing and prescribing the means by which personnel are to operate to accomplish an objective.

PROCESS
See—controlled process
manufacturing process

PROCESS DRAWING
Depicts parts in an intermediate stage of manufacturing.

PROCUREMENT LEAD TIME
The period between the study date for each item of supply until receipt of the first item inspected and accepted by the procuring department. The sum of administrative and production lead time.

PROCURING ACTIVITY
The element of a Government agency or department which maintains cognizance, control, and administration of a contract entered into by the Government agency or department.

PROD
Production.

PRODUCIBILITY
Those inherent design characteristics of an item which determine the factors of production, both kind and quantity, necessary to produce it.

PRODUCT
See—end product
qualified product

PRODUCTION PROD
The process of collecting raw materials and converting them by fabrication into required components and end items. It includes production functions of scheduling, inspection, inventory control, etc.

PRODUCTION CAPACITY
The sum of all the factors of production in a defined situation, such as the national capacity.

PRODUCTION DRAWING
Engineering drawings to which parts are fabricated.

PRODUCTION MODEL
The first completed object to be turned out by a particular method of production which serves as an example of the objects which will follow.

PRODUCTION SAMPLE TEST (VERIFICATION)
Test performed on samples of production equipment at periodic intervals during production to insure that it complies with standards.

PROFICIENCY
An individual's level of skill in performing a particular task at any given moment. It is a function of such factors as aptitude, amount of training, and degree of motivation.
See—maintenance proficiency

PROFICIENCY TEST
A test which measures an individual's level of development in the performance of a given task in order to determine how well he can do it at the moment. The test may involve a sample performance of actual elements of the job, or written questions about the job.

PROFILE
See—flight profile
mission profile
temperature profile

PROG
Program.

PROGRAM PROG
A related series of undertakings designed to accomplish a broad scientific or technical goal. Attainment of such long range goals may be accomplished by implementation of specific projects.

PROGRAM CONTROL
That system to be used to adequately measure and control a given program.

PROGRAM EVALUATION AND REVIEW TECHNIQUE PERT
Method of charting events and obtaining predicted performance in accordance with a schedule.

PROGRAM PLAN
The contractor's detailed plan for implementing a specific program. The plan shall contain specifics such as scheduling, organizations, and testing and method to be used to accomplish same.

PROGRAMMED ROLL
An automatically controlled maneuver of a ballistic missile or satellite to rotate the vehicle about the longitudinal axis.

PROGRAMMER
Also referred to as program device. An assembly that originates signals to other assemblies and/or vehicle/stage systems that are time referenced to a known time.

PROGRESSIVE BASE LINE DIMENSIONING
A special application of base line dimensioning which may be used to conserve space in certain circumstances. Dimensions are established in a straight line from a common datum line using a series of dimensions and single arrow heads, each of which indicates the distance from the datum line or surface.

PROJ
Project.

PROJECT PROJ
A scheduled undertaking, within a program, which may involve the research and development, design, construction and operation of system and associated hardware, or hardware only, to accomplish a scientific or technical objective.
See—space flight project

PRONE-G
Eyeballs out. Acceleration experienced in a back-to-chest direction, expressed in units of gravity.

PROOF-TEST MODEL
A complete flight type and flight weight spacecraft used for testing.

PROPAGATION
Describes the manner in which an electromagnetic wave such as a radar signal, timing signal, or ray of light, travels from one point to another.

PROPELLANT
A liquid or solid substance or substances which either separately or mixed can be changed into a large volume of hot gases at a rate which is suitable for propelling projectiles or air vehicles.
See—auto-igniting propellant
composite propellant
cryogenic propellant
liquid propellant
solid propellant
star-grain propellant

PROPELLANT MASS RATIO
The ratio of the effective propellant mass in the propulsion system to the gross mass.

PROPELLANT STRATIFICATION
The phenomenon of uneven temperature, density, and pressure distribution in a propellant. Propellant stratification increases tank pressure which necessitates extra venting or releasing of gaseous propellant. (Since stratification implies layering, this popularly accepted term is a misnomer.)

PROPELLANT UTILIZATION
The precise control over the mixture ratio of fuel to oxidizer during operation of a liquid rocket.

PROPORTIONALITY
The frequency of a class divided by the total frequency of the distribution.

PROPRIETARY ITEM
An item in which the owner has a proprietary right or interest enabling him to exclude others from its use or to authorize use thereof, subject to such restrictions as he may appropriately impose.

PROPULSION
See—electric propulsion
rocket propulsion

PROSPECTOR
Unmanned lunar roving vehicle.

PROTON
A positively charged subatomic particle of a positive charge equal to the negative charge of the electron but of 1837 times the mass. A constituent of all atomic nuclei.
See—solar protons

PROTOTYPE
An original or model after which a system is copied. A pattern.

PROTOTYPE HARDWARE
Developmental hardware which is representative of the configuration, performance, and functional characteristics of the end item.

PSBLS
Permanent Space Based Logistics System.

PSI
Pounds Per Square Inch.

PSIA
Pounds Per Square Inch Absolute.

PSIG
Pounds Per Square Inch Gage.

PT
Part.

PTCR
Pad Terminal Connection Room.

PULSE CODE MODULATION (TELEMETRY) PCM
The information which is transmitted is contained in the prime position of the pulse in relation to a known reference point.

PULSE DURATION MODULATION **PDM**
Regulation of the length of time of pulses according to a code for the purpose of transmitting messages, which can be received audibly on an oscilloscope or on tape.

PULSE TIMER
See—flight sequencer

PULSED INTEGRATING PENDULUM **PIP**
A single-degree-of-freedom pendulum.. The PIP is the acceleration sensing unit of the PIPA.

PULSED INTEGRATING PENDULUM ACCELEROMETER **PIPA**
An acceleration measuring system with velocity output quantized to discrete values of velocity and capable of synchronization with a digital computer.

PUMP
See—gettering pump

PURGE
To rid a line or tank of residual fluid, especially of fuel or oxygen in the tanks or lines of a rocket after a test firing or simulated test firing.

PURGING SYSTEM
The system which introduces a noncombustible gas, such as carbon dioxide, into the space above propellants to sweep out any toxic or combustible propellants when draining propellant tanks.

PYROTECHNIC TEST AND WEIGHT AND BALANCE FACILITY
An isolated area that is used for building-up the pyrotechnic components associated with the spacecraft and used for the determination of weights and center of gravity of the spacecraft with the assembled pyrotechnic items.

Q

QA
Quality Assurance.

QC
Quality Control.

QUAL
Quality.

QUALIFICATION-CONDITIONAL
Conditional qualification is interpreted as that stage of the overall qualification program in which authorization is granted for initiation of fabrication of deliverable items which may be incorporated into and tested in higher levels of assemblies.

QUALIFICATION TEST
A test of parts, components, subassemblies, and higher levels of assembly which is performed to demonstrate that the design is inherently capable of meeting the established requirements. Tests are designed to locate significant failure modes and to determine the effects of varied stress levels, combinations of tolerances, and drift of design parameters, and combinations and sequences of environments. Destructive tests and inspection of disassembled articles are included.

QUALIFIED PART
A part suited for procurement as revealed by designated test.

QUALIFIED PARTS LIST
A listing of all qualified parts used in the contractors equipment, including method of qualification and stage of qualification. (Conditional qualification vs. complete qualification).

QUALIFIED PRODUCT
An item which has successfully passed the required tests as specified in applicable specification.

QUALITY QUAL
A measure of the degree to which it conforms to specification and workmanship standards. Its numerical rating is obtained by measuring the percentage defective of a lot or population at a given time.
See—acceptable quality level
average outgoing quality
lot quality

QUALITY ASSURANCE QA
A planned and systematic pattern of all actions necessary to provide adequate confidence that the end items will perform satisfactorily in actual operations.

QUALITY CHARACTERISTICS
Those properties of an item or process in the population domain which can be measured, reviewed or observed, and which are identified in the drawings, specifications or contractural requirements.

QUALITY CONTROL QC
A factory-oriented operation for causing a process to manufacture a uniform product within specified limits of percent defective in accordance with the design requirements.
See—statistical quality control
total quality control

QUALITY ENGINEERING
A factory oriented operation for establishing quality tests and interpreting quality data.

QUALITY OF CONFORMANCE
The adherence of a product to the design as it comes off the production line.

QUANTIZATION
The process of converting from continuous values of information to a finite number of discrete values.

R

R AND D
Research and Development.

RADAR
See–doppler radar

RADAR ASTRONOMY
The study of celestial bodies within the solar system by means of radiation originating on Earth but reflected from the body under observation.
See–radio astronomy

RADIAL VELOCITY
Speed of approach or recession of a body from the point of observation along a line connecting the two. It can be determined by using doppler shift methods.

RADIANT ENERGY
Energy traveling in the form of electromagnetic waves, such as light, infrared, radio, and radar. It is measured in units of energy known as ergs, joules, calories, or kilowatts. The term radiation is generally a synonym, although in nucleonics the term radiation includes energy carried by particles as well as electromagnetic waves.

RADIATION
The emission and propagation of energy or matter. Energy traveling as a wave motion. The energy of electromagnetic waves. Radiant particles such as aplha rays or beta rays.
See–electromagnetic radiation
gamma radiation
high-energy radiation
incident radiation
nuclear radiation
soft radiation
solar radiation
solar radiation streams
ultraviolet radiation
visible radiation

RADIATION BELT
A layer of trapped charged particles that surrounds a spatial body.

RADIATION SHIELD
A device used to prevent radiation from biasing the measurement of a quantity and to protect bodies from the harmful effects of nuclear radiation, cosmic radiation, or the like.

RADIO ASTRONOMY
The study of celestial objects through observation of radio waves emitted or reflected by these objects.

RADIO INTERFERENCE
Any undesirable radio-frequency signal which causes a malfunction or degradation of operation of any system or subsystem.

RADIO METEOR
A meteor detected by the reflection of a radio signal from the meteor trail of relatively high ion density (ion column).

RADIO TELESCOPE
A device for receiving, amplifing, and measuring the intensity of radio waves orginating outside the Earth's atmosphere.

RADIOMETER
An instrument that detects and measures the intensity of thermal radiation, especially infrared radiation.

RADIOSONDE
A balloon-borne instrument for the simultaneous measurement and transmission of meteorological data.

RAMJET
A compressorless jet-propulsion device which depends for its operation on the air compression accomplished by the forward motion of the unit.

RANDOM ERRORS
Chance variables that are individually unpredictable. Such errors may be described only in statistical terms.

RANDOM FAILURE
Any failure which occurs by chance, in an accidental, casual, or haphazard manner. Random failures may or may not be related to known failure modes.

RANDOM MASS PHENOMENA
The behavior of a system with many subsystems that divide themselves into groups bound together by some common characteristics or act with others of the same type. These aggregates are change in size, movement, effect, etc.

RANDOM SAMPLE
One in which each item in the lot has an equal chance of being selected in the sample.

RANDOM VARIABLE
A variable, either discrete or continuous, which may assume any one of a number of values, each of which has a fixed probability of occurrence.

RANDOMNESS
An equal chance for any of the possible outcomes.

RANGE
The difference between the greatest and the least of a set of variate values.
See—environmental range
interquartile range
percentile range

RANGER
Rough-landing lunar program. Ranger will take high resolution TV surface pictures during approach to the Moon and will make seismograph studies of the Moon after impact and also investigate charged particles between the Earth and the Moon.

RANGING
A term used to refer to various techniques for determining the distance of a satellite or a spacecraft from a ground based tracking station.

RAREFIED GAS DYNAMICS
The study of the phenomena related to the molecular or non-continuum nature of gas flow at low densities.

RATE
See—equipment failure rate
failure rate
part failure rate
repair rate
system failure rate
vaporization rate
weight flow rate

RATIO
See—by-pass ratio
control ratio
lift drag ratio
mass ratio
slenderness ratio
thrust to weight ratio
thrust-weight ratio

RAYS
See—cosmic rays
gamma ray

RCS
Reaction Control System.

REACTION CONTROL FACILITY
A building constructed to provide for testing of a full size space capsule and to withstand any explosions that may be encountered during the test operations performed on the reaction control system.

REACTION CONTROL SYSTEM **RCS**
System of small, low thrust vernier engines to provide 3-axis control of the spacecraft in the absence of aerodynamic forces.

REACTION ENGINE
An engine that develops thrust by its reaction to ejection of a substance from it. Specifically, such an engine that ejects a jet or stream of gases created by the burning of fuel within the engine.

REACTION NOZZLE
Nozzles of an attitude control system.

REACTOR
See—cavity reactor
dust bed reactor
fluid bed reactor
gaseous core reactor
nuclear reactor
phoebus reactor

READINESS
See—flight readiness firings
operational readiness

READINESS RELIABILITY
The probability that a mission system will be in operating condition when an operational demand is made on it.

READINESS TIME
The time required to obtain a stabilized system, ready to perform its intended function. The time is measured from the point when the system is unassembled or uninstalled to such time as it can be expected to perform accurately. Maintenance activity time is excluded from readiness time.

READOUT
The action of transmitting data, either instantaneously with the acquisition of the data or by play of a magnetic tape upon which the data has been recorded.

READOUT STATION
A recording or receiving radio station where data is received from a transmitter in a probe, satellite, or other spacecraft.

READY TIME
That period of time during which the system is available for operation.

REAL TIME
Time in which reporting on events or recording of events is simultaneous with the events.

REAL TIME COMPUTER
A computer that will provide data read-out simultaneously with acceptance of input data.

REBOUND
Network of passive communication reflectors, follow-on to Echo.

RECOMBINATION
The process by which a positive and a negative ion join to form a neutral molecule or other neutral particle.

RECOVERY
The location and retrieval of the astronauts, scientific samples and data, and spacecraft at the termination of the mission.

RECTANGULAR DIMENSIONING
A method for indicating distances, locations and sizes by means of linear dimensions measured parallel to reference lines or planes which are perpendicular to each other.

RECYCLE
To stop the count and to return to an earlier point in the countdown.

RED-LINE INSTRUMENTATION
Instrumentation to indicate emergency or abnormal operating conditions.

RED-SHIFT
In astronomy, the displacement of observed spectral lines toward the longer wavelengths at the red end of the spectrum.

REDUNDANCY
The existence of more than one means for accomplishing a given task. Parallel redundancy applied to systems where both means are working at the same time to accomplish the task, and either of the systems is capable of handling the job itself in case of failure of the other system. Standby redundancy applies to a system where there is an alternate means of accomplishing the task that is switched in by a malfunction sensing device when the primary system fails.

REENTRY
The return of a vehicle into the atmosphere after a flight above the sensible atmosphere.
See—hyperbolic reentry
parabolic reentry

REENTRY CORRIDOR
That region of the altitude-velocity plane where continuous flight is possible because the dynamic pressure is great enough to support lifting flight and yet the heating rates are low enough to allow economic surface cooling.

REENTRY VEHICLE **RV**
A space vehicle designed to return with its payload to earth through the sensible atmosphere.

REENTRY WINDOW
The area at the limits of the earth's atmosphere through which a space craft, in a given trajectory, can pass to accomplish a successful reentry.

REFERENCE
See—Earth fixed reference
space-fixed reference

REFERENCE DATUM
A plane assumed to be exact for purposes of computation or reference, from which the location of vehicle features may be established.

REFERENCE DIMENSION
A dimension, without tolerance, used for informational purposes and which does not govern manufacturing and inspection operations.

REGENERATIVE COOLING
The cooling of a part of an engine by the propellant. Specifically, the cooling of a rocket-engine combustion chamber or nozzle by circulating the fuel or oxidizer, or both, around the part to be cooled.

REGION
See—isothermal region

REJECTION NUMBER
A number associated with each sample of an attributes sampling plan. An inspection lot is rejected for an inspection if the total number of defectives is equal to or greater than the rejection number associated with that sample.

RELATIVISTIC
In general, pertaining to material such as a subatomic particle moving at speeds which are an appreciable fraction of the speed of light.

RELAXATION METHOD
Technique similar to the gradient methods for solving optimization problems, in which the variables are changed one at a time rather than simultaneously, in covering on a solution.

RELAY
Active communications satellite for civil use.

RELIABILITY
The probability that system, subsystem, component, or part will perform its required functions under defined conditions at a designated time and for a specified operating period.
See—acceptable reliability level
achieved reliability
component and part reliability
computed reliability
design reliability
design reliability assurance
design reliability creation
equipment reliability
flight reliability
functional reliability
individual reliability test
inherent reliability
minimum acceptable reliability
mission reliability
readiness reliability
sampling reliability test

RELIABILITY APPORTIONMENT
Method of budgeting the overall reliability objective among subordinate items.

RELIABILITY ASSESSMENT
An analytical determination of numerical reliability of a system or portion thereof without actual demonstration testing. Such assessments usually employ mathematical

modeling, use of available test results, and some use of estimated reliability figures.

RELIABILITY CONTROL
The coordination and direction of technical reliability activities.

RELIABILITY GOAL
That reliability desired of the design.

RENDEZVOUS
The event of two or more aerospace vehicles meeting in flight at a preconceived time and place.
See—cooperative rendezvous
Earth orbit rendezvous
lunar orbit rendezvous

REPAIR
See—essential repair
mean time to repair

REPAIR RATE
The probability of repair in a finite interval of time from the initiation of the repair action.

REPAIR TIME
Considered to be the total time that a unit is nonoperational, extending from the time of failure until the repaired unit is checked out and found satisfactory.

REPAIRABILITY
The probability that when the actual repair begins the system will be repaired in a given period of time with a given manpower expenditure.

REPLACE
To substitute an operative item for an inoperative or defective item.

REPLACEABILITY
The characteristics of an item that allows it to substitute for another item.

REPLENISHMENT
A term associated with the replacing of cyrogenic propellants.

REQUIREMENT
See—logistic requirements
maintainability requirement
station keeping requirement

RESEARCH
A continued process of scientific investigation prior to and during development. It has for its aim the discovery of new scientific facts, techniques, and natural laws.

RESEARCH AND DEVELOPMENT SPECIFICATIONS
Specifications formally defining the performance requirements, design criteria, design test requirements, and functional demonstrations which are necessary to complete a research and development program.

RESPONSE
See—dynamic response

RETRO
In reverse direction, as with a retrorocket for the purpose of firing opposite to the velocity vector to slow a vehicle, usually for reentry or landing.

RETRO-FITTING
Modification of previously delivered hardware.

RETRO THRUST
Thrust applied in a backward or opposite direction from the direction of motion of the vehicle or spacecraft. Retrothrust is employed to slow a spacecraft from orbital velocity to descent velocity.

RETROGRADE MOTION
Orbital motion opposite in direction to that normal to spatial bodies within a given system or opposite in direction to a reference direction.

RETROGRADE ROCKET
A small vernier rocket used to slow a spacecraft and prepare it for reentry.

REVOLUTION
Motion of a celestial body in its orbit. Circular motion about an axis, usually external to the body.

RF
Radio Frequency.

RGS
Radio Guidance System.

RIFT
Reactor In-Flight Test.

RMS
Root mean square.

ROCK AND SOIL ANALYSIS EQUIPMENT
As a part of the scientific instrumentation subsystem, this equipment provides for obtaining samples of the lunar surface material, for obtaining core samples, and for the analysis of these samples.

ROCKET
See—apogee rocket
booster rocket
chemical rocket
control rocket
dry-fuel rocket
fusion rocket
multistage rocket
nuclear rocket
posigrade rocket
retrograde rocket
sounding rocket
ullage rocket
vernier rocket

ROCKET ENGINE
A reaction engine that contains all the substances necessary for its operation or for the consumption or combustion of its fuel. Does not require intake of any outside substance and is capable of operation in outer space. Also called rocket motor.
See—atomic rocket engine

ROCKET PROPULSION
A type of reaction propulsion in which the propulsive force is generated by accelerating and discharging matter contained in the vehicle. To be distinguished particularly from jet propulsion.

ROCKET SLED
A sled that runs on a rail or rails and is accelerated to high velocities by a rocket engine. This sled is used by the air force in determining G tolerances and for developing crash-survival techniques.

ROCKOON
A rocket research vehicle designed to be carried by a balloon to very high altitude before being fired.

ROLL SIZE DRAWING
Those which, due to their length, are filed in rolls and usually do not have a printed format.

ROTARY HYDRAULIC ACTUATOR
A radial vane and segmented cylinder assembly used to rotate the swing-arms horizontally. It is part of the umbilical tower swing-arm assembly.

ROTATION
The turning of a body about its axis.

ROUGH COMBUSTION CUTOFF
The shut-down or cutoff of an engine due to excessive vibration caused by rough combustion.

RP-1
A kerosene-type fuel.

RP-1 FUEL SYSTEM COMPLEX
Refers to all the facilities and facility equipments used for receiving, handling, storing, filtering, transferring, conditioning, controlling, and monitoring the RP-1 fuel.

RSCS
Rate Stabilization and Control System.

RUMBLE
A form of combustion instability, especially in a liquid-propellant rocket engine, characterized by a low-pitched, low frequency rumbling noise.

RV
Reentry Vehicle.

S

S-BAND
Frequencies in the region of 2500 megacyles per second.

S-I PROPULSION
The S-I stage is powered by eight Rocketdyne H-1 engines developing a total nominal sea level thrust of 1,500,000 pounds. The engines burn LOX and RP-1. Vehicle control and stability are achieved by directing the thrust of the four outboard engines in response to electrical control signals developed in the guidance and control system (housed in the instrument unit).

S-I STAGE
The first stage of the SATURN I launch vehicle. It is designed to propel the vehicle, with payload, through the initial part of the trajectory. The stage is approximately 80-feet long, 21-feet in diameter, and weighs over 50 tons dry. Fully loaded with propellant, the stage weighs over 500 tons.

S-I STRUCTURE
The structural support for the S-I stage is provided by five LOX containers, rigidly support at the forward end by a spider assembly, and at the aft end by the engine thrust-structure assembly. In this configuration, four equal-diameter containers circumvent a single larger diameter container. Between the four outer LOX containers there are four RP-1 fuel containers. The fuel containers are not rigidly attached to the spider beam, and therefore do not structurally support the stage. The stage structure includes four large fins and four stub fins which aid in stabilizing the vehicle in the lower atmosphere. In addition, the fins provide the vehicle with eight integral support and holddown points while the vehicle is on the pad. The fins are attached rigidly to the stage outriggers.

S-IB PROPULSION SYSTEM
The S-IB stage is powered by eight Rocketdyne H-1 engines developing a total nominal sea level thrust of 1,500,000 pounds. The engines burn LOX and RP-1. Vehicle control and stability are achieved by directing the thrust of the four outboard engines in response to electrical control signals developed in the guidance and control system (housed in the instrument unit).

S-IB STAGE
The first stage of the SATURN IB launch vehicle. It is designed to propel the vehicle with payload through the initial part of the trajectory. The stage is approximately 80-feet long, 21-feet in diameter, and weighs over 40 tons dry. Fully loaded with propellant, the stage weighs over 500 tons.

S-IB STRUCTURE
The structural support for the S-IB stage is provided by five LOX containers rigidly supported at the forward end by a spider assembly, and at the aft end by the engine thrust structure assembly. In this configuration, four equal-diameter containers circumvent a single large diameter container. Between the four outer LOX containers there are four RP-1 fuel containers. The fuel containers are not rigidly attached to the spider beam, and therefore do not structurally support the stage. The stage structure includes eight fins which aid in stabilizing the vehicle in the lower atmosphere. In addition, the fins provide the vehicle with eight integral support and holddown points while the vehicle is on the pad. The fins are attached rigidly to the stage outriggers.

S-IC PROPULSION SYSTEM
The S-IC stage is powered by five Rocketdyne F-1 engines developing a total nominal sea level thrust of 7,500,000 pounds. The engines burn LOX and RP-1. Vehicle control and stability are obtained by directing the thrust of the four outboard engines in response to electrical control signals developed in the control system (housed in the instrument unit).

S-IC STAGE
The first stage of the SATURN V launch vehicle. It is designed to propel the space vehicle for the first 150 seconds of the trajectory. The stage is approximately 138-feet long, 33-feet in diameter, and weighs over 140 tons dry. Fully loaded with propellant, the stage weighs over 2300 tons.

S-IC STRUCTURE
Propellant for the engines of the S-IC stage is contained in two containers connected by an intertank section. The containers are cylindrical with ellipsoidal bulkheads supported by frames and longitudinal stiffeners. The stage is structurally designed to have free-standing capability without having the propellant containers pressurized. Four fins, located outboard of the engines, aid in aerodynamic stabilization of the vehicle.

S-II PROPULSION SYSTEM
The S-II stage is powered by five Rocketdyne J-2 engines developing a total vacuum thrust (nominal) of 1,000,000 pounds. The engines burn LOX and LH-2. Vehicle control and stability are obtained by directing the thrust of the engine in response to electrical control signals developed in the guidance and control system (housed in the instrument unit).

S-II STAGE
The secondary stage of the SATURN V launch vehicle. It is designed to propel the space vehicle from an altitude of 200,000-feet to 600,000-feet. The stage is approximately 81-feet long, 33-feet in diameter, and weighs over 36 tons

dry. Fully loaded with propellant, the stage weighs over 500 tons.

S-II STRUCTURE
As a result of propellant container design, the structure of the S-II stage is self-supporting even though unpressurized. The propellant containers are integral, with the LH-2 container forward of the LOX.

S-IV PROPULSION SYSTEM
The S-IV stage is powered by six Pratt and Whitney RL10 A-3 engines developing a total-vacuum thrust (nominal) of 90,000 pounds. The engines burn LOX and LH-2. Vehicle control and stability are achieved by directing the thrust of all six engines in response to electrical control signals developed in the guidance and control system (housed in the instrument unit).

S-IV STAGE
The second stage of the SATURN I launch vehicle. It is designed to propel the payload into a nominal-circular Earth orbit. The stage is approximately 41-feet long, 18-feet in diameter, and weighs over 12,000 pounds dry. Fully loaded with propellant, the stage weighs over 57 tons.

S-IV STRUCTURE
As a result of propellant container design, the structure of S-IV stage is self-supporting even though unpressurized. The propellant containers are integral (supported by a common bulkhead) with the LH-2 container forward of the LOX. The stage does not require fins for stability.

S-IVB PROPULSION SYSTEM
The S-IVB stage is powered by a single Rocketdyne J-2 engine developing a total vacuum thrust (nominal) of 200,000 pounds. The engine burns LOX and LH-2. Vehicle pitch and yaw control are achieved by directing the thrust of the engine. Roll control is provided by an auxiliary propulsion system. Control signals originate in the instrument unit. There are two auxiliary propulsion modules, one on either side of the stage. Each module contains five hypergolic motors used for attitude and ullage control.

S-IVB STAGE
The second stage of the SATURN IB launch vehicle and the third stage of the Saturn V launch vehicle. It is designed to inject the spacecraft into an Earth parking orbit, and to then restart to give the velocity required for Earth-lunar transit. The stage is approximately 59-feet long, 22-feet in diameter, and weighs over 10 tons dry. Fully loaded with propellant, the stage weighs over 120 tons.

S-IVB STRUCTURE
As a result of propellant container design, the structure of the stage is self-supporting even though unpressurized. The propellant containers are integral with the LH-2 container forward of the LOX container.

S-1
Booster for the SA-1 vehicle.

SA-D1
Dynamic test vehicle.

SA-T1
Static test booster.

SA-1
First Saturn flight vehicle.

SAC
Strategic Air Command.

SADDLE POINT
Stationary point which is a relative minimum with respect to at least one independent variable, and a relative maximum with respect to another.

SAFETY
See—factor of safety
margin of safety
ultimate safety factor
yield safety factor

SAMPLE
See—average sample number
censored sample
production sample tests (verification)
random sample

SAMPLE SIZE
The number of units in a sample. Also used in the sense of the number of observations in a sample.

SAMPLE UNIT
A unit of product selected without regard to its quality, to be part of a sample.

SAMPLING
See—acceptance sampling
double sampling
multiple sampling
sequential sampling
single sampling

SAMPLING PLAN
A specific plan which states the sample sizes, and the criteria for accepting, rejecting or taking another sample to be used in inspecting a lot.
See—acceptance sampling plan
multiple sampling plan

SAMPLING RELIABILITY TEST
Same as the individual reliability test except that it is longer in duration, and is done on samples selected at random from equipment successfully passing the requirements of the individual reliability tests.

SA
Saturn.

SATELLITE
An attendant body that revolves about another body.
See—active repeater satellite
artificial Earth satellite
communications satellite
earth-stabilized satellite
Explorer satellite series
fixed satellite
passive satellite
stationary satellite
synchronous satellite

SATURN SA
Previous designation for Saturn I.

SATURN B
Previous designation for Saturn IB.

SATURN C-1
Previous designation for Saturn I.

SATURN C-1B
Previous designation for Saturn IB.

SATURN C-5
Previous designation for Saturn V.

SATURN I BLOCK I
Launch vehicle used on the Apollo program for flight testing and development of the Saturn S-I stage systems. The second and third stages are water filled dummy tanks simulating the weight of propellant filled upper stages.

SATURN I BLOCK II
Launch vehicle used for developmental flights of the Saturn booster, the launching of Apollo spacecraft into earth orbit, and the launching of Apollo spacecraft into lunar return and reentry trajectories.

SATURN I SEPARATION SYSTEM
The separation of the S-I and S-IV stages is accomplished during a short coast period prior to S-IV engine ignition using a single plane separation mode. Separation is assisted by four ullage motors mounted on the aft skirt of the S-IV structure and four retromotors mounted on the spider beam of the S-I stage. During the separation, sequence interstage blow-out panels are removed to vent LOX from the S-IV engine thrust chambers.

SATURN IB
Launch vehicle planned in the support of the Apollo program by launching Apollo spacecraft modules in Earth orbit. Additional missions may include lunar explorations and lunar logistics support.

SATURN V
Launch vehicle used in the Apollo program, the primary mission of which is to boost the payloads used to perform the manned lunar landing and return.

SATURN I-B SEPARATION SYSTEM
The separation of the S-IB and S-IVB stages is accomplished during a short coast period prior to S-IVB engine ignition, using a single plane separation mode. Separation is assisted by four ullage motors mounted on the aft skirt of the S-IVB structure and four retromotors mounted on the S-IVB aft interstage. During the separation sequence interstage blow-out panels are removed to vent LOX from the S-IVB engine thrust chambers.

SATURN V SEPARATION SYSTEM
Separation of the expended S-IC stage is by a dual plane separation mode. This mode consists of severing the S-IC/S-II interstage at the J-2 engine exit plane followed by separation of the interstage section. Eight retromotors located in the S-IC stage engine fairings are used in the separation sequence. Separation of the expended S-II stage is accomplished during a short coast period prior to ignition of the S-IVB engine. Retromotors on the S-IVB after interstage effect positive separation.

SATURN ELECTRICAL SYSTEM
The electrical system for the vehicle supplies electrical power properly conditioned to meet the requirements of the guidance and control, instrumentation, command destruct, ordnance, and propulsion systems. The primary power source is composed of zinc silver-oxide batteries with associated distributors and inverters. The basic design goal is to have no power applied across the stage interface. This is accomplished by including a complete electrical power supply in each stage (including the instrument unit).

SATURN GUIDANCE AND CONTROL SYSTEM
The all-inertial guidance and control system is contained in the instrument unit. Control signals from the system are applied to the active stage during powered flight. A predetermined time-tilt trajectory is used during the first stage operation with control signals going to the first stage engine actuators. For the remaining powered phases, a path adaptive guidance mode is used with control signals to the engine actuators to achieve the mission trajectory.

SATURN INSTRUMENTATION SYSTEM
Each stage of any Saturn launch vehicle has an independant instrumentation system, which consists of the measuring and signal conditioning, telemetry, antennas, tracking, and range safety systems. The range safety system is interstage connected, to insure redundancy.

SATURN MECHANICAL SYSTEM
The mechanical system of any Saturn configuration includes, within each stage, an electron hydraulic system for each engine, ullage motors and retromotors for stage separation, and equipment for environmental conditioning.

SC
Spacecraft.

SCALE HEIGHT
A measure of the relationship between density and temperature at any point in an atmosphere.

SCALING EFFECT
The influence of size on the operation and efficiency of a system.

SCANNER
See—Lyman-Alpha scanner

SCATS
Simulation, Checkout and Training System.

SCHEMATIC DIAGRAM
A diagrammatic drawing that shows function symbols with interconnections to illustrate circuit operation. It does not necessarily identify physical location of components or connections between them.
See—advanced schematic

SCHMOO PLOT
A plot which shows the operating margins when the component under test is varied between its upper and lower "end of life" limits, while all other components are at the worst end of the initial acceptance tolerances.

SCIENTIFIC INSTRUMENTATION SUBSYSTEM
This subsystem is designed primarily for selenologic research. It includes tools and instruments necessary to perform programmed scientific experiments. Proposed components of this subsystem include; lunar atmosphere analyzer, gravitometer, magnetometer, radiation spectrometer, specimen return container, rock and soil analysis equipment, soil and temperature instrument, and seismographic equipment.

SCOUT
4-stage solid rocket launch vehicle.

SCREAMING
A form of combustion instability, characterized by a high-pitched noise, especially in a liquid-propellant rocket engine, of relatively high frequency.

SCREENING TEST
Test employing nondestructive environmental, electrical, or mechanical stresses to identify anomalous items.

SCRUB
To cancel a scheduled rocket firing, either before or during countdown.

SCS
Stabilization and Control System.

SEALED CABIN
A cabin sealed against exfiltration or infiltration of any gas, liquid, or solid.

SECONDARY COSMIC RAYS
Secondary emission in the atmosphere stimulated by primary cosmic rays.

SECONDARY FAILURE
A cessation of ability of an item to perform its required function due to the malfunction of another item. Secondary failure is one which occurs as a by product of an independent failure.

SEISMOGRAPHIC EQUIPMENT
As a part of the scientific instrumentation subsystem, this equipment provides the capability for investigating the subsurface structure of the Moon by measurements taken after exploding a charge below the lunar surface.

SELECTED INTERCHANGEABILITY
Exists when all components manufactured to the same general specification are not interchangeable. The component parts are placed in classes so that there will be complete interchangeability in each class.

SELECTED PART
A part that has been approved or accepted by a user for one or more applications based upon known satisfactory usage or test in connection with this or some other program.

SELENOCENTRIC
Relating to the center of the Moon. Referring to the Moon as a center.

SEMI
A prefix denoting half. Occurring or coming every half period. E.g., a semi monthly event will occur twice a month. Compare with bi.

SENSOR
The component of an instrument that converts an input signal into a quantity which is measured by another part of the instrument. Also called sensing element.

SEPARATION
In multistage space vehicles, the action time or place at which a burned-out stage is discarded and the remaining missile continues on its course.

SEQUENTIAL SAMPLING
Sampling inspection where, after each unit is inspected, the decision is made to accept, reject, or to inspect another unit.

SEQUENTIAL TEST
The measurement by statistical hypothesis of a sequence of samples where it is decided at each step in the sequence to accept the hypothesis, to reject the hypothesis, or to take an additional sample.

SERB
Study of Enhanced Radiation Belt.

SERT
Space Electric Rocket Test (program to test electric propulsion systems).

SERVICE MODULE SM
The portion of the spacecraft housing the stores and systems which do not require maintenance or direct operation by the crew and are not required by the command module after separation.

SERVICE MODULE SIMULATOR
This simulator, when used in conjunction with the spacecraft adapter simulator and the launch vehicle simulator, assists in checkout of the command module (CM) without utilizing the service module (SM). The simulator provides, to either SM interface, a facsimile of the SM signals, power requirements, loads, and other functions. No provisions are made for simulation of self contained functions of the SM.

SERVICE PROPULSION SYSTEM **SPS**
The main propulsion system in the service module (SM) powered by a liquid-propellant rocket engine, designed to provide propulsion for gross translunar and transearth midcourse velocity corrections, and for lunar orbit injection and transearth injection. During Earth orbit missions, the system provides propulsion for Earth orbital transfer and correction and orbit injection. It can also provide thrust for post-atmospheric abort following jettison of the launch escape system.

SERVICE STRUCTURE
A steel structure which is used to erect, assemble, checkout and service space vehicles. The structure includes work platforms, hoisting equipment, personnel and equipment elevators. It is usually mobile so that it may be removed from the launcher area. Also called a gantry.

SERVICE TEST
A test, under simulated or actual conditions, to determine the characteristics, capabilities, and limitations of a given piece of equipment or material. Also a test made at any point in the development of a piece of equipment or material, with the object of predetermining ultimate capability and serviceability.

SERVICEABILITY
Equipment design, configuration, installation, and operation that minimizes maintenance, inspection and servicing.

SERVO FLUTTER
See—coupled servo flutter

SET
A unit or units and necessary assemblies, subassemblies and parts connected or associated together to perform an operational function.

SEXTANT **SXT**
An instrument designed for the measurement of angles subtended at an observer's position by distant objects.

SFA
Sunfinder Assembly.

SFERICS
Radio static associated with severe electrical storms.

SFOF
Space Flight Operations Facility (operations center for JPL space programs).

SHADOWGRAPH
A picture or image in which steep density gradients in the flow about a body are made visible, the body itself being presented in silhouette.

SHAKE-TABLE TEST
A laboratory test in which an instrument component is placed in or on a vibrator that simulates one of the conditions during the launch of a missile or other vehicle.

SHELF LIFE
Storage or nonoperational time that can be accumulated on items before they are placed in operating use or before one of the following actions must be taken: visual inspection, functional testing, overhauling, scrapping, or rejuvenating.

SHIELD
See—radiation shield

SHIFT
See—doppler shift
red shift

SHIRTSLEEVE ENVIRONMENT
Environment not requiring the wearing of a pressure suit.

SHOCK WAVE
See—normal shock wave

SHOCK ISOLATION
The protection of equipment, components, systems and facilities, etc., from shock-type forces which are associated with explosions, impacts, decelerations and accelerations, etc.

SHOCK STRUTS
Shock attenuating devices for personnel support, restraint couches, and other parts of the CM and LEM.

SHOCK-WAVE DURATION
The time required for the value of the instantaneous acceleration to depart from and return to zero.

SHOCK-WAVE RISE TIME
The required time for the value of the instantaneous acceleration to increase from zero to a maximum value.

SHOT
Slang for launch.

SHUTDOWN
The process of reducing engine thrust to zero. Synonymous with cutoff.

SIGMA LIMITS
The interval about the mean expressed in units of standard deviation.

SIGNIFICANCE LEVEL
A predetermined expected fraction of all cases of repetition of the test in which the hypothesis is rejected under the test, even rough it is true.

SILO ENCLOSURES
Enclosures which protect the space vehicle on the launch pad from adverse wind and weather. The enclosures are part of the service structure, integral with the service platforms and take the shape of a silo when the split sections are mated.

SIMULATED FLIGHT TEST
A test in which all vehicle subsystems are operated, in so far as possible, through a typical sequence simulating the entire flight of the vehicle. This test also provides a compatibility test of the vehicle system.

SIMULATION
A set of test conditions designed to duplicate field operating and usage environments.

SIMULATION, CHECKOUT AND TRAINING SYSTEM **SCATS**
This system contains equipment to simulate telemetry, trajectory, and command data as well as voice communications, for subsystem tests, open loop simulations, closed loop simulations, and ground network checkout.

SIMULATION CONTROL CENTER
A facility within the integrated mission control center equipped in a manner to allow control and evaluation of the operational procedures and actions of ground-based elements involved in closed-loop mission simulations.

SIMULATOR
A device or equipment used during manufacturing, test, checkout and training operations, which produces a signal, appearance or environment similar and equivalent to the real system, equipment, stage, etc.

See—command module simulator
five-degree of freedom simulator
flight simulator
launch escape simulator
service module simulator
space simulator
spacecraft adapter simulator
stage interface simulator

SINGLE SAMPLING
Sampling inspection in which a decision to accept or to reject is reached after the inspection of a single sample.

SIO
Staged In Orbit.

SIZE

See—actual size
basic size
design size
lot size
minimum material size
nominal size
sample size

SIZE DIMENSION
A specified value of a diameter, width, length, or other geometrical characteristic directly related to the size of an object.

SKETCH DRAWING
Original reproducible drawings prepared by engineering or drafting personnel for the purpose of facilitating or expediting the fabrication or procurement of parts, test equipment, etc., when time does not permit preparation of regulation drawings according to approved standard drafting practices.

SKEWNESS
Non-symmetry in a frequency distribution.

SKIN TRACKING
The tracking of an object by means of radar.

SKIP-OUT BOUNDARY
The upper limits of the reentry corridor.

SKIRT
See—adapter skirt

SKY SCREEN
An element of equipment used by the range safety officer that provides indication whenever the missile deviates from planned trajectory.

SKYLARK
A sounding rocket.

SLENDERNESS RATIO
A configuration factor expressing the ratio of a rocket vehicle's length to its diameter.

SLOSHING
The back-and-forth splashing of a liquid fuel in its tank, creating problems of stability and control in the vehicle.

SLOW-MEMORY LINER
A covering over the astronauts couch which will improve load distribution and absorb shock on landing impact.

SLUG
A unit of mass. The mass of a free body which if acted upon by a force of 1 pound would experience an acceleration of 1 foot per second.

SLURRY
A suspension of fine solid particles in a liquid.

SM
Service Module.

SNAP
System for Nuclear Auxiliary Power.

SNAP-10
A nuclear electric power generating system using a liquid metal cooled reactor and thermoelectric units for thermal to electrical energy conversion.

SNAP-2
A nuclear electric power generating system incorporating a liquid metal cooled nuclear reactor and a rankine cycle energy conversion system. Mercury is the energy conversion system working fluid that drives the turbine, which is directly connected to an electrical generator.

SNAP-50
An advanced turboelectric power generating system intended to be in the power range of hundreds of kilowatts.

SNAP-8
A program developing nuclear power systems to be carried on board spacecraft.

SNPO
Space Nuclear Propulsion Office.

SOFAR NET
A hydrophone system used to provide impact location on Earth of reentry vehicles, by measuring time of arrival of sound waves in the ocean and then triangulating. SOFAR is an acronym for Sound Fixing And Ranging.

SOFT LANDING
Landing on a planetary body at a slow speed to avoid destruction to the landing vehicle.

SOFT RADIATION
Radiation which is absorbed by an absorber equivalent to 10 centimeters of lead or less.

SOIL TEMPERATURE INSTRUMENT
As a part of the scientific instrumentation subsystem, this instrument provides the capability for measuring lunar surface and lunar subsurface temperature.

SOLAR ATMOSPHERIC TIDE
Vertical motion of the atmosphere due to thermal or gravitational action of the Sun.

SOLAR CELL
A photovoltaic device that converts sunlight directly into electrical energy.

SOLAR COLLECTOR
A parabolic mirror-type device used to collect and concentrate solar energy.

SOLAR CONCENTRATOR
A device such as a parabolic mirror used to concentrate radiant solar energy to a small area.

SOLAR CORONA
Outer atmospheric shell of the Sun.

SOLAR FLARE
Solar phenomenon which gives rise to intense ultraviolet and corpuscular emission from the associated region of the Sun, affecting the structure of the ionsphere which interfers with communications.

SOLAR MAGNETOGRAM
A recording obtained on Earth that measures the magnetic activity of sunspots.

SOLAR NOISE
Electromagnetic radiation which radiates from the atmosphere of the Sun at radio frequencies.

SOLAR PADDLE
Paddle-like devices attached to a spacecraft, which contain small solar cells used to convert sunlight into storable electrical energy.

SOLAR PROTONS
Elementary charged particles and nuclei of hydrogen atoms accelerated by the Sun and ejected into space with energies up to several billion electron volts.

SOLAR RADIATION
The total electromagnetic radiation emitted by the Sun.

SOLAR RADIATION STREAMS
All forms of radiant energy, including visible light, that emanate from the Sun.

SOLAR SAILS
Devices which can utilize solar pressure to orient or accelerate space vehicles.

SOLAR TIME
Time measured by reference to the apparent motion of the Sun about the Earth.

SOLAR WIND
A stream of protons constantly moving outward from the Sun.

SOLID PROPELLANT
Specifically, a rocket propellant in solid form, usually containing both fuel and oxidizer combined or mixed and formed into a monolithic (not powdered or granulated) grain.

SONIC SPEED
The speed of sound. By extension, the speed of a body traveling at mach 1.

SOPHISTICATED
Complex and intricate. Making use of advanced art. Requiring special skills to operate.

SOUND PLANE LEVEL
The pressure generated by a sound wave. The unit of measure is the decibel which is usually the unit for measuring the relative loudness of sounds.

SOUNDING ROCKET
A rocket designed to explore the atmosphere within 4,000 miles of the Earth's surface.

SOURCE CONTROL DRAWING
An engineering drawing defining vendor substantiation testing. The drawings are applicable to vendor designed parts only.

SPA
Servo Power Assembly.

SPACE
Specifically, the part of the universe lying outside the limits of the Earth's atmosphere. More generally, the volume in which all spatial bodies, including the Earth, move.
See—annular space
circumplanetary space

SPACE EQUIVALENCE
A state of being in which a condition or conditions within the atmosphere are virtually identical with a condition or conditions beyond the atmosphere.

SPACE EXPLORATION
The effort established, through space programs, to develop man's knowledge of the universe.

SPACE FLIGHT PROJECT
A task within the realm of space flight which leads to the accomplishment of mission objectives. E.g., collection of scientific data, transportation of cargo and personnel between two terminals, and satisfaction of commercial requirements.

SPACE LAW
A projected code of international law that would govern the use or control of space.

SPACE MEDICINE
A branch of aerospace medicine concerned specifically with the health of persons who make flights beyond the sensible atmosphere.

SPACE PLATFORM
Habitable orbiting installation, normally geocentric, used as a base for launching vehicles for space research.

SPACE PROBE
A research vehicle intended to reach a distant point in space.

SPACE REDDENING
The observed reddening, or absorption of shorter wavelengths, of the light from distant celestial bodies caused by scattering by small particles in interstellar space.

SPACE SCIENCE
The specific discipline associated with the development of knowledge about the universe.

SPACE SIMULATOR
A device which simulates some condition or conditions existing in space and is used for testing equipment and training programs.

SPACE SYSTEM
A system consisting of launch vehicle, spacecraft, ground support equipment, and test hardware used in launching, operating and maintaining vehicle or craft in space.

SPACE VEHICLE SV
The entire spaceborne element. It consists of the spacecraft and the launch vehicle.
See—operational space vehicle
man rated space vehicle

SPACE VEHICLE SIMULATOR
An assemblage of equipments that simulates the entire space vehicle to validate the vehicle integrated checkout system.

SPACE VEHICLE SYSTEM
The over-all complex of equipments, methods, procedures, and personnel requirements needed to fulfill the mission of the space vehicle.

SPACE-FIXED REFERENCE
An oriented reference system in space, independent of Earth phenomena for positioning.

SPACE-TIME DILEMMA
According to Einstein's Theory of Relativity, time would slow down increasingly for occupants of systems moving at velocities approaching the speed of light, relative to the Earth. This slowdown would not be apparent to inhabitants of the spacecraft until they returned to Earth.

SPACECRAFT SC
The vehicle required to perform the mission after injection into the mission trajectory and consists of the command module, service module and lunar excursion module.
See—Apollo spacecraft
operational spacecraft
test spacecraft

SPACECRAFT ADAPTER
A shell of adhesive bonded aluminum honeycomb, reinforced with sheet metal, which performs the physical mating of the Apollo spacecraft to the Saturn launch vehicle. For the lunar landing mission, it houses the lunar excursion module (LEM).

SPACECRAFT ADAPTER SIMULATOR
This simulator supplies signals and functions that are supplied operationally by the adapter to the spacecraft and the launch vehicle, and so, facilitates combined-systems checkout of these neighbors without an adapter. Primarily, the adapter simulator consists of wiring, since only a few signals or functions have their origin in the adapter. The signals are primarily sensor responses.

SPACECRAFT OPERATIONS AND CHECKOUT FACILITY
A facility that houses the assembly and checkout for final testing of assembled mechanical and electrical components in the spacecraft.

SPACECRAFT SYSTEM
The spacecraft and all equipment on the ground or in space that is associated with flight preparation and required during flight operation.

SPACESUIT
Pressure suit designed for wear in space or at very low-pressure altitudes within the atmosphere, designed to permit wearer to leave the protection of a pressurized cabin.

SPARE PARTS
A component of an item used to maintain or repair the item.

SPEC
Specification.

SPECIFIC GRAVITY
The ratio of the weight of any volume of a substance to the weight of an equal volume of another substance, taken as standard, at a constant or stated temperature. Solids and liquids are usually compared with water at four degrees centigrade.

SPECIFIC IMPULSE
A performance parameter of a rocket propellant, expressed in seconds, and equal to thrust divided by weight flow rate.

SPECIFICATION SPEC
A detailed description of the characteristics of a product and of the criteria which must be used to determine whether the product is in conformity with the description.
See—detail specification
material specifications
research and development specifications

SPECIFICATION WEIGHT
The maximum allowable weight for an item as specified in a contract statement of work or a procurement specification.

SPECIMEN RETURN CONTAINER
As a part of the scientific instrumentation subsystem, this small container will be filled with lunar material. This container is sealed so that no material or bacteria can enter on the return flight.

SPECTROMETER
An instrument which measures some characteristics, such as intensity of electromagnetic radiation, as a function of wavelength or frequency.

SPECTRUM
Any series of energies arranged according to wavelength.
See—electromagnetic spectrum

SPHERE
See—celestial sphere

SPHYGMOMANOMETER
An instrument for measuring blood pressure in the arteries. There are many forms of the instrument, each named for the person who devised it.

SPIDER
A piece of handling equipment which resembles a spider in appearance. The legs or arms of the spider are attached to the equipment to be handled, while the head of the spider, which is usually a ring, is supported and maneuvered by hoisting equipment.

SPIN STABILIZATION
Stabilization of a space craft by gyroscopic forces.

SPS
Service Propulsion System.

SPUTTERING
Dislocation of surface atoms of a material bombarded by high-energy atomic particles.

SQUIB
A small pyrotechnic device used to fire the igniter in a rocket, or for some similar purpose. Not to be confused with a detonator which explodes.

STABILITY
The property of a subsystem which causes forces or moments to be developed to restore equilibrium whenever that equilibrium is disturbed.
See—dynamic stability

STABILIZATION
See—spin stabilization

STABILIZATION AND CONTROL SYSTEM SCS
A system in the Apollo spacecraft that controls angular orientation and stabilization of the spacecraft about its three axes by sensing angular displacement and angular rate. For automatic control, engine gimbals and the reaction control system (RCS) control valves are actuated. For manual operation, information is fed to displays. Separate systems are located in the command module (CM) and the lunar excursion module (LEM). Basic components are:
(1) Attitude reference.
(2) Body rate gyro package.
(3) Control electronic assembly.
(4) Manual controls.
(5) Displays.

STAGE
The independent propulsive sections of a launch vehicle which are progressively jettisoned during or immediately following the powered portions of flight.
See—dynamic test stage
flight stage
main stage

STAGE CALIBRATION EQUIPMENT
Mobile cart-mounted equipment required for the calibration of stage pressure switches, thermo switches, and pressure-operated valves.

STAGE INTERFACE SIMULATOR
Those elements of the vehicle integrated checkout system that simulate the effects of the remainder of the vehicle on a particular stage.

STAGE LOOSE EQUIPMENT
Equipment in this category consists of such items as fire shrouds, engine skirts, etc.

STAGE LOOSE EQUIPMENT HARDWARE
This hardware consists of suitable containers, covers, cables, shoring, blocking shock mounts, and other miscellaneous handling equipments that are required to protect the space vehicle stage loose equipment components and assemblies during transportation.

STAGE SUBSTITUTE
Those elements of the vehicle integrated checkout system which take the place of a stage when the particular stage is not available for continued space venicle checkout. It is a functional substitute for a stage.

STAGED-IN-ORBIT SIO
A boost trajectory similar to the restart except that the stage burnout and separation occur simultaneously with the parking orbit condition. Continuation to other trajectories would be accomplished by ignition of another stage.

STAGNATION AREA
The area on a body acting in an airstream which is the division area for the lines of airflow on either side of the body. The air is practically stationary in this area.

STANDARD STD
Documents that establish uniform engineering and technical criteria for items, materials, processes, methods, design, and engineering practices.
See—Government standard
industry standard
job training standard

STANDARD DEVIATION
A measure of the variability of a group in terms of the dispersion of individual scores around the average or mean score.

STANDARD PART
A part which has multible use and is recognized by and acceptable to the user.

STANDARDIZATION
A process of establishing by agreement, engineering, criteria, terms practices, item configuration and processes to achieve the greatest practicable uniformity, assure the minimum variety of such items and practices, and to effect the optimum interchangeability of equipment parts and components.

STAR-GRAIN PROPELLANT
A solid propellant, its cross section shaped like a star.

STARFISH
A rocket probe.

STATIC FIRING
The firing of a rocket motor, rocket engine or an entire stage in a hold-down position to measure thrust and accomplish other tests.

STATIC TESTING
The testing of a device in a stationary or held-down position as a means of testing and measuring its dynamic reactions.

STATION KEEPING REQUIREMENT
The requirement of a satellite to remain in particular precise orbit with a constant velocity.

STATIONARY ORBIT
An orbit in which an equatorial satellite revolves about the primary at the same angular rate as the primary rotates on its axis. The satellite thus appears to be stationary over a point on the primary.

STATIONARY POINT
Point where the value of a function is not changing with respect to any of the independent variables.

STATIONARY SATELLITES
Satellites which maintain a nearly constant relationship with a fixed point on the Earth's surface.

STATISTICAL ACCEPTANCE TEST
A procedure designed to determine, with a prescribed accuracy, whether a characteristic of a product is in conformity with acceptance criteria set forth for that product.

STATISTICAL INFORMATION
An accumulation of numerical or qualitative data.

STATISTICAL MEASURE
The representative or estimator of the value of a parameter in a probability distribution.

STATISTICAL QUALITY CONTROL
A procedure based in part on the central limit theorem and the theory of probability. Statistical refers to a method of making decisions from mathematical laws concerning process control.

STATISTICS
Accurate data maintained for control purposes.

STD
Standard.

STEERING
See—jet steering
vector steering

STL
Space Technology Laboratory.

STOCHASTIC VARIABLE
Variable quantities with a definite range of values, each of which, when chosen at randon, can be attained with a definite probability.

C-2-

STOICHIOMETRIC
Of a combustible mixture, having the exact proportions required for complete combustion.

STREAM
See—exhaust stream
jet stream
solar radiation streams

STRENGTH
See—ultimate strength
yield strength
yield strength load factor

STRESS
See—allowable yield stress
combined stress
component stress
nominal stress limits

STRESSED LIMITS
The environmental limits to which the crew may be subjected for limited periods of time such as launch, reentry, and landing.

STUB FINS
Short-span aerodynamic surfaces, used on some launch vehicles for control or stabilization purposes.

STUDY
See—design study
exploratory studies
feasibility study

STUDY LAYOUT
Shows configurations, ideas, and methods suggested by engineers, designers, etc., for an item. The layout is used for further study, stress and weight considerations, and comparisions.

STUDY OF ENHANCED RADIATION BELT **SERB**
Program to study the radiation belt created by high altitude nuclear explosion.

SUB-GROUP
One of a series of groups or observations obtained by subdividing a larger group.

SUBASSEMBLY
A combination of parts comprising a definable entity of a component and performing a function essential to the proper operation of that component.
See—inter gimbal subassembly

SUBATOMIC PARTICLE
A component of an atom such as an electron, proton, meson, etc.

SUBCONTRACTOR
Any contractor under contract to another contractor. These are usually qualified further as first tier, second tier, etc. First tier subcontractors are those under contract to the prime, principal or associate contractors, second tier is next level removed, etc.

SUBGRAVITY
A gravitational effect that is less than one G, e.g., less than the normal measure of the Earth's gravity.

SUBSONIC
Speeds less than the speed of sound.

SUBSTITUTE
See—limited substitute
stage substitute

SUBSTITUTE ITEM
Items which possess such functional and physical characteristics that permit their being exchanged within the limitations imposed by the application requirements.

SUBSYS
Subsystem.

SUBSYSTEM **SUBSYS**
A major functional subassembly or grouping of items or equipment which is essential to operational completeness of a system.

SUDDEN IONOSPHERIC DISTURBANCE
A complex combination of sudden changes in the condition of the ionosphere, and the effects of these changes.

SUIT
See—anti-g suit
G-suit
pressure suit

SUNFLOWER
A solar power system designed to develop 3 kilowatts of power. Sunflower is being developed for use as a power source for satellites and space probes.

SUNSPOT
A relatively dark area on the surface of the Sun, consisting of a dark central umbra and a surrounding penumbra that is intermediate in brightness between the umbra and the surrounding photosphere.

SUNSPOT CYCLE
A periodic variation in the number and area of sunspots with an average length of 11.1 years but varying between 7 and 17 years.

SUPERSONIC
Pertaining to speeds greater than the speed of sound.

SUPINE G
Eyeballs in. Acceleration experienced in the chest-to-back direction, expressed in units of gravity.

SUPPLY DOWNTIME
That time during which work is not done on a system because of the unavailability of a needed item from the usual supply.

SUPPORT COST
The cost of maintaining system equipment during its operational life, including the total impact of all requirements such as technical data, test equipment, spare parts, special tools, maintenance equipment, maintenance facilities, manpower, training and training equipment.

SURFACE
See—functional surface

SURFACE IONIZATION
One method of producing ions by the impingement of a propellant on a hot and usually catalytic surface.

SURVEYOR
Lunar soft landing program, using Centaur launch vehicle.

SUSCEPTIBILITY
See—threshold susceptibility

SUSTAINER
A part of the propulsion system of a vehicle which does not separate from the vehicle during its powered flight. The term is usually applied to rocket propulsion systems when used as the principal propulsion system to distinguish them from those used as auxiliary engines or boosters.

SUSTAINER ENGINE
An engine that maintains the velocity of a missile or rocket vehicle, once it has achieved its programed velocity through use of a booster engine.

SV
Space Vehicle.

SWEAT COOLING
Method of controlling the excessive heating of a reentering body. Surfaces subjected to excessive heating are made of porous material through which liquid of high-heat capacity is forced. The evaporation of this coolant completes the sweat-cooling process.

SWEEP
The motion of the visible dot across the face of a cathode-ray tube, as the result of scanning deflection of the electron beam.

SWITCH GEAR
The composite electrical equipment which is employed for the switching and protection of an electrical distribution system.

SXT
Sextant.

SYNCHRONOUS ORBIT
An orbit with a period of 24 sidereal hours (the same period as that of Earth revolving about its axis). The satellite rotational speed and the Earth's speed of rotation are in synchronism.

SYNCHRONOUS SATELLITE
An equatorial west-to-east satellite orbiting the Earth at an altitude of 22,300 statute miles, making one revolution in 24 hours, and is synchronous with the Earth's rotation.
See—advance syncom

SYNERGIC CURVE
A curve plotted for the ascent of a rocket or space vehicle calculated to give the vehicle an optimum economy in fuel with an optimum velocity.

SYS
System.

SYSTEM SYS
Any combination of parts, assemblies and sets joined together to perform a specific operational function or functions.

See—basic hole system
basic shaft system
biopower system
control system
cooling system
Earth landing system
ecological system
exhaust system
gas vortex system
ground communications and tracking system
ground operational support system
guidance and control system
guidance and navigation system
horizontal pre-flight checkout system
instrumentation system
launch escape propulsion system
launch vehicle system
limit dimensioning system
liquid hydrogen (LH-2) system complex
liquid oxygen system (LOX) complex
manned space flight system
mast connection system
measuring system
multiple-mode guidance system
physical-chemical system
purging system
RP-1 fuel system complex
space vehicle system
telemetering system
unilateral tolerance system
vertical alignment system

SYSTEM CHANCE FAILURES
Chance failures in the system which cause the system to malfunction or to stop operating.

SYSTEM FAILURE RATE
The rate at which a system fails to perform its intended function.

SYSTEM INTEGRATION

The management process by which the systems of a project are made compatible to achieve the purpose of the project.

SYSTEMS ENGINEERING

The process of applying science and technology to the study and planning of a system so that the relationships of various parts of the system and the utilization of various subsystems are fully established before designs are committed.

SYSTEMS MANAGER

The third member of the Apollo flight crew. The system manager occupies the right-hand couch during all flight phases, except portions of the lunar parking orbit. His primary responsibilities are to operate the in-flight test system, and monitor and maintain all systems other than guidance and navigation. During critical mission phases, he monitors certain critical parameters of the spacecraft and propulsion system.

T

T-TIME
Any specific time, minus or plus, as referenced to zero, or launch time.

TABULATED DRAWING
Depicts similar items with differences in characteristics, dimensions, material, finish, and other requirements. These differences are tabulated on the drawing and the fixed characteristics depicted once.

TAKEOFF MASS
The mass of a rocket vehicle and its payload at the time of takeoff.

TAKEOFF WEIGHT
Weight of a rocket vehicle ready for takeoff, including the vehicle, fuel, and payload.

TANGENTIAL ELLIPSE
The transfer ellipse from Earth orbit to orbits of other planets, designed to use a minimum of fuel. Also known as a hohmann orbit.

TANK DESICCANT SYSTEM
A system of dessicant canisters and hoses installed in the stage propellant tanks during periods of shipment or storage to keep the tanks clean and dry and to permit the tanks to breathe.

TAPER
A difference in diameter, width or thickness per unit of length, measured at right angles to the length. Generally expressed as inches per foot, sometimes expressed as a ratio.

TASK
See—maintenance task
mission task

TASK ANALYSIS
An analytical process employed to determine on a time base, the detailed performance required of a man and machine, the nature and extent of their interactions, and the effects of environmental conditions and malfunctions. Behavioral steps are isolated in terms of preceptions, decisions, memory storage, and motor outputs required, as well as the errors which may be expected. The data is used to establish equipment design criteria, personnel and training requirements, etc.

TAVE
Thor-Agena Vibration Experiment (experimental payload launched with Alouette).

TEAR DOWN INSPECTION
An inspection in which a component, subassembly or assembly is disassembled down to its parts, so that each part may be nondestructively inspected to determine if it is made according to its applicable documentation, or to determine the effect of environmental or other tests upon each part.

TECHNICAL MANUAL **TM**
A technical publication which contains information designed to meet the needs of personnel engaged or being trained in the safety, operation, maintenance, service, overhaul, installation and inspection of specific items of equipment and materials.

TELECOMMUNICATIONS SYSTEM
In the spacecraft, this system provides means of two-way voice communication among crew members, the command module (CM), the lunar excursion module (LEM), and ground operational support system (GOSS). It also provides telemetry and television transmission from the CM or LEM to GOSS, as well as receiving and retransmittal of tracking signals from GOSS.

TELEMETERING
The technique of relaying instrument readings and intelligence to remote indicating devices by means of radio or radar signals.

TELEMETERING SYSTEM
The complete measuring, transmitting, and receiving apparatus for remotely indicating, recording, and integrating information.

TELEMETRY
The science of measuring quantities, transmitting the measured value to a distant station, and there interpreting, indicating or recording the quantities measured.

TELESCOPE
See—radio telescope

TEMPERATURE PROFILE
The variation in temperature throughout an object or region.

TERM
A word used to describe an item for the purpose of storing it or retrieving it from a storage and retrieval system.

TERMINAL GUIDANCE
Guidance required in the final phase of a rendezvous maneuver of spacecraft.

TERMINAL VELOCITY
The hypothetical maximum speed a body, under given conditions of weight and thrust, could attain along a specified

straight flight path, if diving through an unlimited distance in air of uniform density.

TERRELLA
Self-contained manned spaceship in which crew life is maintained during space flight by a closed-cycle breathing system.

TERRESTRIAL
Pertaining to the Earth.

TEST
Examination, investigation, evaluation and documentation of inherent properties, functionability, environmental reaction, variances and reliability of any product, system, subsystem, vehicle, equipment assembly, part, material, and process.

See—acceptance test
acceptable environmental range test
battleship test
BOP test
calibration test
captive test
cold-flow test
controlled test
development test
engineering test
environmental test and service building
final test data
flight test
full duration static test firing
functional test
holddown test
hot test
individual operational test
individual reliability test
inertial component test equipment
laboratory calibration test
post-static test
prelaunch test
preproduction test
pre-static test
predictive test
proficiency test
pyrotechnic test and weight and balance facility
qualification test
sampling reliability test
screening test
sequential test
service test
shake-table test
simulated flight test
type approval test
vehicle calibration test

TEST CONSOLE
A grouping of test panels into one integrated rack or console.

TEST DATA
Results of a test in the form of numbers, charts, tapes, etc.

TEST FACILITIES
Devices and facilities which are used in the installation, maintenance, operation and calibration of equipment.

TEST TO FAILURE
The process of submitting an item to stress levels within design limits until failure occurs. (Accelerated tests to failure results in subjecting an item to stress levels beyond design limits to induce early failure).

TEST POINT
A convenient, safe access to a circuit or system so that a significant quantity can be measured or introduced to facilitate maintenance, repair, calibration, and alignment.

See—exposed test point

TEST SPACECRAFT
A special spacecraft instrumented for conducting research and development testing.

TESTING

See—attributes testing
destructive testing
development testing and evaluation
flight testing
marginal testing
non-destructive testing
static testing

TESTING TO DESTRUCTION
The intentional operation of an equipment or portion thereof to ultimate failure. This type of test will often reveal design weaknesses that would cause unreliability.

THEODOLITE
A sighting and measuring telescopic instrument that gives a reading on horizontal or vertical angles.

THERMAL
Pertaining to heat or temperature.

THERMAL BARRIER
Speed at which friction heat, generated by rapid passage of an object through the atmosphere, exceeds endurance compatible with the function of the object.

THERMAL LOAD
Stresses imposed upon a missile structure because of expansion or contraction (or both) of certain structural elements when exposed to a wide range of temperatures.

THERMIONIC
Operating by means of an electrically charged particle emitted by an incandescent material.

THERMODYNAMICS
The study of the relationships between heat and mechanical energy.

THERMOSPHERE
The ionosphere considered as a region of temperature variation from minus twenty-eight degrees F to several thousand degrees F.

THRESHOLD SUSCEPTIBILITY
An undesirable response which is barely recognizable from the normal output.

THROAT
In rocket and jet engines, the most constricted section of an exhaust nozzle.

THRUST
The pushing force developed by an aircraft engine or a rocket engine. Specifically, the product of propellant mass flow rate and exhaust velocity relative to the vehicle.
See—dual thrust
leveled thrust
maximum thrust
pound thrust

THRUST CHAMBER
The chamber of a jet or rocket motor in which volume is increased through the combustion process to obtain high velocity gases through the nozzle.

THRUST COMMIT
The time, when all engines have been running for 3 seconds and all other parameters are normal, the start of the final launch sequence.

THRUST DECAY
When a rocket motor burns out or is cut off, propulsive thrust does not fall to zero instantaneously, but progressively declines over some fraction of a second.

THRUST GENERATOR
A device which produces motive power. In an electric propulsion system, it is composed of an electric power source and a device which expels a high velocity flow of the propellant.

THRUST VECTOR CONTROL
Controlling the flight of a missile by controlling the direction of thrust.

THRUST-TO-EARTH-WEIGHT RATIO
Ratio of the thrust developed by the vehicle to the mass of the vehicle multiplied by Earth's gravity.

THRUST-WEIGHT RATIO
A quantity used to evaluate engine performance and is obtained from dividing the thrust output by the engine dry weight.

TIDE
See—solar atmospheric tide

TIME
See—available time
operating time
readiness time
ready time
real time
repair time
shock-wave rise time
solar time
trouble-shooting time
usable time
warm-up time

TIME CRITICAL EQUIPMENT
Equipment with a finite life which if not monitored, could result in a failure. Consideration shall be given to shelf life.

TIROS
Television Infrared Observation Satellite (meteorological satellite).

TM
Technical Manual.

TOL
Tolerance.

TOLERANCE **TOL**
The total permissible variation of size, form, or location.
See—bilateral tolerance
environmental tolerance
fabrication tolerance
maximum tolerance
minimum tolerance
unilateral tolerance system

TOPSIDE SOUNDER
Satellite project to measure electron density of ionosphere.

TORR
Suggested international standard term to replace the equivalent English term "millimeter of mercury" and its abbreviation.

TOTAL DOWNTIME
The number of hours that a system is not available for use, regardless of reason.
See—total mean downtime

TOTAL EMISSIVE POWER
Emissive power emitted over the whole spectrum of wavelength.

TOTAL EMITTANCE
Emittance of the whole range of wavelengths.

TOTAL MEAN DOWNTIME
The total mean active maintenance downtime, including both corrective and preventive maintenance, in a time period of interest divided by the total number of maintenance actions in that time period.

TOUCHDOWN
The action or moment of landing a space vehicle, manned or unmanned, on the surface of a planet.

TOWER
See—arming tower
collimation tower
escape tower
ivory tower
launcher umbilical tower
ordnance tower
umbilical tower

TRACKING
The process of following the movement of a satellite or rocket by radar radio, and photographic observations.
See—skin tracking

TRAJ
Trajectory.

TRAJECTORY TRAJ
In general, the path traced by any body, as a rocket, moving as a result of externally applied forces.
See—atmospheric trajectory
ballistic trajectory
circumlunar trajectory
escape trajectory
free-flight trajectory
Keplerian trajectory
vacuum trajectory

TRANSDUCER
A device which converts energy from one form to another for the purpose of detection and measurement of information. Transducers are often used as sensors.

TRANSEARTH
The phase of flight from lunar orbit to Earth orbit or reentry.

TRANSEARTH TRAJECTORY
Spacecraft trajectory from the Moon to the Earth.

TRANSFER ELLIPSE
Path followed by a body moving from one elliptical orbit to another.

TRANSFER ORBIT
In interplanetary travel, an elliptical trajectory tangent to the orbits of both the departure planet and the target planet.

TRANSITION FIT
One having limits of size so prescribed that either a clearance or an interference may result when parts are assembled.

TRANSLATION
Motion in which all points of the moving body have, at any instant, the same velocity and direction of motion.

TRANSLATIONAL THRUST
Thrust required to propel a missile or space vehicle from a given position to a different position.

TRANSLUNAR
This word is commonly used in referring to the phase of flight from Earth orbit to lunar orbit. Most reference books describe translunar as referring to space outside the Moon's orbit about the Earth, as compared to cislunar referring to space between the Earth and the Moon's orbit.

TRANSPONDER
A radio or radar system which is triggered by a received signal. It transmits only in response to a received signal of the proper frequency. It is used as an identification device and for distance measurement.

TRANSPORTATION BARGE
A modified vessel used to provide for river and sea transportation of large space vehicle stages.

TRANSPORTATION HANDLING KIT
A kit which is stage oriented and consists of all the handling hardware, except hoists and cranes, required to place a particular stage of the space vehicle on its transporter.

TRANSPORTER
Any vehicle used to support and effect movement of the stages on land.
See—crawler transporter
launcher transporter

TRANSPORTER PRIME MOVER
A tractor-type vehicle which is used to provide the means of moving the transporter during land transportation modes.

TRANSPORTER/LAUNCHER
A transportable launcher which supports an integral umbilical tower and an erect space vehicle. It usually consists of the transporter (crawler) unit and the launcher (platform) unit.

TRANSVERSE ACCELERATION
The inertial force produced by an acceleration acting across the body, perpendicular to the long axis of the body, as in a chest-to-back direction.

TROPOPAUSE
The upper limit or limits of the troposphere.

TROPOSPHERE
The lower layer of the Earth's atmosphere, extending to about 60,000 feet at the equator and 30,000 feet at the poles.

TROUBLE SHOOTING
Locating and diagnosing malfunctions or breakdowns in the equipment by means of systematic checking or analysis.

TROUBLE SHOOTING TIME
The time required to determine or to isolate the cause of a system malfunction. It does not include the time required to replace or to repair the units in which the fault occurred.

TWO-BURN BOOSTER
Proposed configuration for the C-5 booster. The first two stages and part of the third will be used for orbital insertion.

Once in orbit, the third stage will be relit to accomplish lunar trajectory insertion.

TYPE APPROVAL TEST
A determination of the suitability of a particular model for utilization in a specific assignment.

TYPE I DOCUMENTATION
Documentation requiring NASA approval.

TYPE II DOCUMENTATION
Documentation required for coordination, surveillance, and information.

TYPE III DOCUMENTATION
Defined as the documentation requiring preparation and retention by the contractor, being made available to authorized representatives of the NASA for review, upon request.

U

ULLAGE
The amount that a container lacks of being full.

ULLAGE ROCKET
Small rockets used to impart forward thrust to the vehicle or stage to shift the propellant to the rear of the tanks prior to firing the main engines.

ULTIMATE LOAD
That load at which a failure-producing general collapse or instability buckling of the structure occurs.

ULTIMATE PRESSURE
The pressure at which the component material is stressed to produce complete rupture or bursting of the component. This is also the pressure that produces instability buckling.

ULTIMATE SAFETY FACTOR
The ratio of the ultimate strength of a structure to the load limit.

ULTIMATE STRENGTH
The magnitude of the load or stress which will cause the structure to fail, or the magnitude of the maximum load or stress which the structure will carry.

ULTIMATE STRESS
The stress at which a material fractures or ruptures.

ULTRAVIOLET RADIATION
Electromagnetic radiation shorter in wavelength than visible radiation but longer than X-rays. Roughly, radiation in the wavelength interval between 10 and 4000 angstroms.

UMBILICAL CONNECTIONS
The electrical, hydraulic, and pneumatic connections between the ground support equipment and the vehicle.

UMBILICAL CORD
Any of the servicing electrical or fluid lines between the ground and an upright rocket missile or vehicle before the launch. Often shortened to umbilical.

UMBILICAL SERVICE ARM
An arm whose function is the same as an umbilical arm or umbilical swing arm.

UMBILICAL SWING ARM
A metal arm which extends horizontally toward the space vehicle from the umbilical. It supports the service lines that link the space vehicle to the ground systems. The swing arm is part of the umbilical tower swing arm system and is supported by the tower and fastened to it by a hinged joint that contains a rotary hydraulic actuator (ROTAC).

UMBILICAL TOWER
A vertical structure supporting the electrical servicing and fluid lines running to a rocket in launching position.

UNDIMENSIONED DRAWING
Depicts, to scale, loft time information for templates, patterns, and printed circuits.

UNILATERAL TOLERANCE SYSTEM
Allows variation in only one direction from the design size.

UNIT
Anything considered as complete in itself but functioning as a part of an assembly, subsystem, or system.

See—astronomical unit
coupling display unit
instrument unit
sample unit

UPPER-AIR OBSERVATION
A measurement of atmospheric conditions above the effective range of a surface weather observation. Also called sounding, and upper air sounding.

USABLE TIME
Time during which equipments are capable of doing useful work.

USEFUL LIFE
The total operating time between debugging and wearout.

UTILIDOR
Utility corridor for protective housing of underground conduits.

V

VAB
Vertical Assembly Building.

VACTL
Vertical Assembly Component Test Laboratory.

VACUUM
See—hard vacuum
high vacuum

VACUUM TRAJECTORY
That portion of a missile's flight that takes place above a chosen upper limit of the atmosphere.

VAN ALLEN BELTS
Two doughnut-shaped belts of high energy charged particles trapped in the Earth's magnetic field. The minimum altitude of the inner belt ranges from approximately 100 miles near the magnetic poles to more than 1000 miles at the equator. The maximum altitude of the outer belt extends to approximately 40,000 miles at the equator.

VAPORIZATION RATE
The unit mass of a solid or liquid that is changed to a vapor or gas in a unit of time.

VAPORIZER
A piece of equipment which is used to convert liquid hypergolic fluids such as LOX and LH-2 into gaseous hypergolic fluids to effect pressurization of the ground LOX and LH-2 storage tanks. The vaporizer is essentially a radiator-type-heat exchanger and forms a part of the LOX system complex and LH-2 system complex respectively.

VARIABLE GEOMETRY INLET
An engine inlet which can be varied as to shape or area to provide for maximum efficiency through a range of airspeeds.

VECTOR CONTROL
Control affecting direction, and magnitude of the direction, of the motor.
See—thrust vector control

VECTOR STEERING
A steering method where one or more thrust chambers are gimbal-mounted so that the direction of the thrust force (thrust vector) may be tilted in relation to the center of gravity of the missile to produce turning.

VEH
Vehicle.

VEHICLE **VEH**
Specifically, a structure, machine, or device (aircraft or rocket) designed to carry a burden through air or space. More restrictively, a rocket craft.
See—aerodynamic vehicle
aerospace vehicle
development vehicle
injection vehicle
launch vehicle
launch vehicle system
lunar trajectory injection vehicle
man rated space vehicle
operational launch vehicle
operational space vehicle
reentry vehicle
space vehicle
space vehicle system

VEHICLE ACCEPTANCE TEST
System and subsystem test to insure vehicle specification compliance, before vehicle is accepted for flight use.

VEHICLE CALIBRATION TEST
Tests to determine if the onboard vehicle measuring device or component is within specifications.

VEHICLE HORIZONTAL CHECKOUT
Systems test performed with the vehicle in the horizontal position.

VEHICLE STAGE
The documented stage, including those parts installed by vehicle documentation plus any portion of an interstage, spacer, or vehicle instrumentation unit, which remains attached to the documented stage for any period of time after separation.

VEHICLE VERTICAL CHECKOUT
Systems test performed with the vehicle in the vertical position.

VELOCITY
Rate of motion in a given direction.
See—acoustic velocity
burnout velocity
circular velocity
escape velocity
exhaust velocity
orbital velocity
radial velocity
terminal velocity

VENDOR
An individual or concern from which a contractor or subcontractor purchases equipment or services which usually do not require research and development effort.

VERNIER ENGINE
A rocket engine of small thrust used primarily to obtain a fine adjustment in the velocity and trajectory of a ballistic missile or space vehicle just after the thrust cutoff of the last propulsion engine. Used secondarily to add thrust to a booster or sustainer engine. Also called vernier rocket.

VERNIER ROCKETS
Small rockets on a spacecraft, fired on command or automatically, to correct spacecraft spin, attitude, direction, or orbit.

VERTICAL ALIGNMENT SYSTEM
An optical equipment system which is used to align the space vehicle with the launcher or launcher platform so that it is properly oriented in the launch position.

VERTICAL ASSEMBLY BUILDING **VAB**
An enclosed structure to be used for the vertical assembly and checkout of space vehicles and their components.

VERTICAL CHECKOUT
System or subsystem tests performed with the vehicle in the vertical position.
See—vehicle vertical checkout

VERTICAL LAUNCH
A launch in which the missile, or vehicle, starts from a vertical position.

VESTIBULAR MECHANISMS
The processes of the inner ear.

VIBRATION
See—acoustic vibration

VICINITY PLAN DRAWING
Delineates the relationship of a site to features of the surrounding area, such as towns, bodies of water, railroads, highways, etc.

VIS
Visual Instrumentation Subsystem (camera payload for lunar photography).

VISIBLE RADIATION
Electromagnetic radiation lying within the wavelength interval to which the human eye is sensitive. This portion of the electromagnetic spectrum is bound by ultraviolet and infrared radiation.

VISUAL ACUITY
A more concentrated form of visibility. It is the resolving ability of the eye to discern fine details.

VORTEX
See—gas vortex system

VOYAGER
Mars and Venus space probe program (follow-on to Mariner).

VPLCC
Vehicle Propellant Loading Control Center.

VTF
Vertical Test Fixture.

W

WADD
Wright Air Development Division (USAF).

WAIVER
Any relaxation of existing requirements.

WALLOPS STATION
Provides a launch, tracking and data acquisition capability for small launch vehicles and many of the sounding rockets used in NASA's program. Serves as an experimental station in support of advanced aerodynamic research programs, and provides for flight tests on instrumentation. The site is located on a small island off the east coast of Virginia, about ten miles from Chincoteague.

WARM-UP TIME
Time measured from the application of power to an operable system to the instant when the system is capable of functioning in its intended fashion.

WARNING STREAMERS
Protective covers removed before flight, for space vehicle protuberances and apertures which must be protected during ground operations.

WATER TORUS
A water spray ring with V-jet and fog nozzles. It is sometimes referred to as an emergency water fire-fighting system and is located on the launcher in an area where water can be directed at the first stage engines.

WAVELENGTH
Distance measured along line of propagation between two points which are in phase on adjacent waves.

WEAROUT FAILURES
Failures caused by the normal aging process. They can be forestalled by preventive maintenance.

WEIGHT **WT**
Gravitational force on a mass.
See—actual weight
dry weight
empty weight
takeoff weight

WEIGHT AND BALANCE KIT
Equipment used to weigh a complete, assembled dry stage of a space vehicle to determine its longitudinal center of gravity. This equipment is also known as mass-properties determination equipment.

WEIGHT FLOW RATE
The flow rate of a liquid propellant expressed in pounds per second.

WEIGHTLESSNESS
Absence of any apparent gravitational pull on an object.

WESTERN OPERATIONS OFFICE **WOO**
NASA's Western Operations Office at Santa Monica, California, serves all operational interests of the agency as a headquarters branch in the western region of the United States. The office, reporting to the Headquarters Office of Administration, has as it primary mission contract negotiation and management of research and development contracts with the aeronautical and space industry in its territory.

WET EMPLACEMENT
A launch emplacement that provides a deluge of water for cooling the flame bucket, missile engines, and other equipment during the launch of a missile.

WHITE NOISE
Noise which contains the whole spectrum of frequencies (or tones). Similar to white light which contains the spectrum of colors.

WHITE ROOM
A clean room designed to be inherently free of dust and other contaminants.

WHITE SANDS MISSILE RANGE **WSMR**
Located at White Sands, New Mexico, this site is used for evaluating the stability and operational characteristics of the launch escape system (LES).

WIND TUNNEL
A device, for aerodynamic tests, through which a stream of velocity controlled air is drawn.

WINDOW
See—launch window
reentry window

WIRING DEVICES
The accessory parts and materials which are used in the installation of wiring, such as terminals, connectors, junction boxes, conduit, clamps, insulation, and supports.

WOO
Western Operations Office.

WORD DESCRIPTION DRAWING
An item that can be completely described without any delineation, whenever misinterpretation cannot occur.

WORKING LAYOUT
Fully released layouts containing all the necessary information for the manufacturer and assembly of the parts described on the layout. Working layouts are used primarily for relatively small, singular designs of apparatus mockups employing simple details.

WORKING PRESSURE
The maximum pressure to which the component is subjected under steady state conditions.

WRIGHT AIR DEVELOPMENT DIVISION WADD
A center located at Wright-Patterson AFB, Ohio, conducting research, development, test, and evaluation in aerodynamics, human factors, materials, electronics equipment, and aerospace sciences.

WSMR
White Sands Missile Range.

WT
Weight.

X

X-RAY
Electromagnetic radiation of very short wavelength, lying within the wavelength interval of 0.1 to 100 angstroms (between gamma rays and ultraviolet radiation). Also called X-radiation, and roentgen ray.
"X-radiation," "roentgen ray."

X-15 PROGRAM
A joint NASA-Air Force-Navy program of hypersonic and very high altitude flight research utilizing a rocket powered research aircraft designated as X-1.

X-20A PROGRAM
An Air Force-NASA program employing a manned hypersonic glider launched into orbit by a Titan III booster. The primary mission is to test the feasibility of orbital glider systems.

Y

YAW
Lateral rotational or oscillatory movement of a vehicle about its vertical axis. The amount of movement is measured in degrees.

YIELD LOAD
That load which must be applied to the structure in order to cause a permanent deformation of a specified amount.

YIELD SAFETY FACTOR
The ratio of the yield strength of a structure to the limit load.

YIELD STRENGTH
The magnitude of the load or stress which must be applied to the structure in order to cause a permanent deformation of a specified amount.

YIELD STRENGTH LOAD FACTOR
The load factor which will cause the yield strength to be reached.

Z

ZERO FAILURE CRITERIA
For qualification tests, this term relates to the ground rule of assuming that no failures will occur during the qualification program.

ZERO GRAVITY
Weightlessness.

ZERO GRAVITY EFFECT
The change in the behavior of a substance or system introduced into an environment free of gravitational force.

ZONE
See—anacoustic zone
hyperacoustic zone

PROPOSAL FOR ADDITION, REVISION, OR DELETION TO THE APOLLO TERMINOLOGY

This form is available to provide the user with a convenient method of submitting comments, additions, deletions, or revisions to aid OMSF in keeping the Apollo Terminology current and useful. Please submit your proposals to:

National Aeronautics and Space Administration
Code MII-E
Washington, D. C. 20546

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APOLLO TERMINOLOGY

WORD OR TERM		ABBREVIATION *(if any)*
PROPOSED ACTION ☐ ADDITION ☐ REVISION ☐ DELETION	SOURCE OF DEFINITION ☐ ORIGINAL ☐ OTHER *(state below)*	SYMBOL *(if any)*

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APOLLO TERMINOLOGY

WORD OR TERM		ABBREVIATION *(if any)*
PROPOSED ACTION ☐ ADDITION ☐ REVISION ☐ DELETION	SOURCE OF DEFINITION ☐ ORIGINAL ☐ OTHER *(state below)*	SYMBOL *(if any)*

DEFINITION *(if available)*

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